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CONTENTS

DEALING WITH IBM

DEPARTMENTS

Page 2

COMMENT 2
INTERNATIONAL 57
VIEWPOINT 62

FEATURES

ROUNDTABLE 8
How four users work with IBM
Moderated by Glenn Rifkin

HOW MUCH WILL THE PC CHANGE? 17
IBM's chance to make a splash
By Aaron Goldberg

SOLVING CICS PROBLEMS 21
Tune-up suggestions from users worldwide
By Steve Piggott

IBM AND AI 25
Few technologies will prove as lucrative
By Kenneth Sonenclar

PRICE-PERFORMANCE 29
Competition in the mid-range, but not the high end
By Bob Djurdjevic

INSIDE THE RELATIONAL 'STRATEGY' 37
Slow moves in DBMS
By Edgar F. Codd

THE EMPEROR OF 'THE IBM' 44
Meet Tom Watson Sr., the man who built the company
By Herb Grosch

GETTING THE MOST OUT OF IBM 51
Profiles of six large users
By Joanne Kelleher

Page 17

Page 25

INTERVIEWS

EDWARD LUCENTE 59
LARRY FORD 60

COVER PHOTOS BY P. CHARLES LADOUCEUR

COMMENT

As 1990 nears, IBM faces change and challenge

BY WILLIAM ZACHMANN

The final years of the 1980s mark an especially critical period for International Business Machines Corp. IBM's accelerated conversion from lease and rental to direct sales in the first half of the decade is having a negative impact on revenue growth. Even more significant, however, is the fact that fundamental changes in the technologies of information are making it much more difficult for IBM to maintain the preeminent position the company has held for more than three decades.

Although IBM is a major player in nearly every segment of the market for information systems hardware and software, it is only in large mainframe systems that the company's dominance remains what it has been in the past. Even in segments where IBM remains the top vendor, competitors typically account for a larger proportion of the market than they did 10 or 20 years ago.

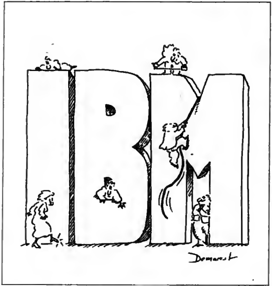
In personal computers, IBM has recently begun to lose market share quite dramatically. In modems and PC software, IBM is only one among many competitors, some of whose market shares equal or exceed IBM's. These factors, combined with an economy that is only slowly growing, appear to be bringing IBM toward the end of 1986 face-to-face with what is likely to be the first time since the Great Depression that earnings per share declined for two years in succession. Were the economy to turn downward into a severe recession, IBM could face one or more quarterly losses.

On the other hand, there can be no doubt that IBM is a company with an enormous reservoir of managerial, sales and technical talent that has overcome serious challenges before. It would be foolhardy to assume that IBM will not ultimately be able to meet the current challenges.

> The bottom line is that while IBM may be able to make things a bit more complicated for compatible competitors, it is very unlikely that a more proprietary line of IBM PCs will be able to lock them out.

Without question, the area in which IBM is most dramatically being challenged today is the PC market. Having successfully established a de facto industry standard with the Personal Computer line, IBM is finding that the standard is one thet the company can no longer easily control.

Worldwide, vendors of IBM PC-, Personal Computer XT- and Personal Computer AT-compatible systems number in the hundreds. From Compaq Computer Corp., which has become a kind of domestic Mercedes or BMW to IBM's Cadillac, to the extremely low-cost compatibles derogatorily dismissed as clones, dozens of U.S. vendors are vying with IBM and with each other.



Internationally, the story is much the same — from major vendors like Ing. C. Olivetti & Co. and NEC Corp. to the Great Wall computer made by the People'a Republic of China and the unbelievably inexpensive systems soldered together "while you wait" in Hong Kong and Taiwan.

Throughout 1986, one research study after another has documented IBM's declining market share, especially in the retail channel. And major chains thet have been the mainstay of IBM'a third-party distribution in the past, like Businessland, Inc. and Computerland Corp., are now offering their own compatibles.

IBM will almost certainly take steps in 1987 to introduce new PCs with new features thet contain proprietary hardware or software in read-only memory in an attempt to put some distance between it and the compatible vendors. A very likely move will be to incorporate more advanced graphics and user interface software that would not be easily run on compatible systems.

In addition, IBM'a RT Personal Computer is clearly an effort to obtain acceptance for a PC system based upon a proprietary IBM microprocessor thet would be very difficult for others to duplicate profitably.

IBM will almost certainly offer new models with significantly enhanced performance to woo users to this more proprietary alternative. Whether these efforts will be successful, however, is very much open to question. The open architecture of the original PC was a very important element in its success. Users are well aware of the benefits they receive from the intense competition in the PC marketplace.

Unlike traditional mainframe and minicomputer systems where every architecture was naturally proprietary, modern microprocessor-based systems are built on standard architectures provided by the semiconductor vendors.

Proprietary architecture on PCs is rather like copy protection on PC software: It is quite obviously there for the benefit of the vendor, not for the user. If the bitter pill is coated with enough sugar — that is, features not available elsewhere — then users may be willing to tolerate a proprietary architecture.

But the inherently open character of microprocessor-based systems makes gaining acceptance for a proprietary architecture very difficult. Prior efforts by IBM in this direction have not been notably successful. The PCjr, the PC XT, the Personal Computer AT/370, the 3270 Personal Computer and more recently the PC Convertible and the RT PC have had, at best, modest success. None had a significant impact on the standard that each of them sought, in one way or another, to tweak in a proprietary direction.

The bottom line is most probably thet while IBM may be able to make things a bit more complicated for compatible competitors, it is very unlikely that a more proprietary line of IBM PCs will be able to lock out competitors. The inertia of the current installed base weighs too heavily on the marketplace for that.

Ultimately IBM can be expected to respond to the competitive challenge in PCs with much more interesting and, for most users, more appealing measures. There are two primary options open to IBM: Offer significantly improved features and capabilities and/or become much more aggressive in pricing.

Certainly, IBM is working very hard to offer larger corporate users enhanced capabilities for linking to IBM mainframes and networks. This area affords IBM some important opportunities to gain or retain customer loyalty by offering more features.

But there are other, more widely relevant areas in which IBM might take a real lead. Perhaps the most interesting of these is in the use of optical disks in connection with superior graphics and image handling. There is little room for doubt that this technology has been the subject of considerable attention at IBM, and it is quite probable thet products will be forthcoming before long.

Of course, IBM can also respond to competitive challenges by simply lowering prices, offering higher performance or both. This, too, is not as easy as it may first seem, however. IBM is more constrained than many think.

In the first place, because PCs already offer much lower price/performance and are growing dramatically in capabilities, aggressive pricing of more capable systems by IBM runs the risk of drawing sales away from other more profitable products. Small businesses using PCs instead of System/36s may boost the sale of PCs, but it won't do much for IBM'a bottom line.

Even more fundamentally, though contrary to common opinion, IBM is not well positioned to compete on price. Although IBM's highly efficient manufacturing operation can undoubtedly make systems at costs at or below those of the vast majority of competitors, direct manufacturing costs are only a portion of the true cost of goods sold.

By the time sales — general and administrative — and research and development costs are added, IBM'a real cost base becomes much higher than that of many other vendors. In addition, the expectations for IBM's profit margins, both internally and externally, especially in the financial community, are significantly higher than the average of competitive firms. Margins that would be acceptable to many smaller firms are not acceptable to IBM.

This brings us to a second major challenge that IBM is facing: the growing "commoditization," as I have called it, of the market for information systems. IBM'a problems with PC commodity-like competition, far from being an isolated event, are the early indications of an accelerating shift away from traditional proprietary architectures and toward increasingly standardized alternatives from multiple vendors.

This situation constitutes the essence of IBM'a most crucial challenge for the next few years. The first generation of information systems, characterized by centralized systems and proprietary architectures, is starting to give way to what will really be only the second generation of information systems.

This generation will be characterized by an increasingly dominant role for standardized, networked, microprocessor-based workstations and network servers. The computer industry of the mid- and late 1990s will be, in many ways, more similar to the consumer electronics industry of today than to the computer industry of the past.

Commoditization of information system markets will be a problem for IBM during the remainder of the 1980s and the early 1990s. More powerful multiuser systems and network servers based upon microprocessors such as the Intel Corp. 80386 and the Motorola, Inc.

■ CONTINUED ON PAGE 5

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COMMENT

As long as IBM accounts remain committed to SNA as their dominant networking strategy, the company is able to gain advantage over competitors and limit competition. However . . . the gathering momentum of universal standards undermines IBM's ability to create its own proprietary standards.

■ CONTINUED FROM PAGE 2

68030 will become more widely available and easier to use. IBM's problems with competition from compatible PCs will spread to other segments of the product line.

IBM's past proliferation of incompatible system architectures is yet another challenge for the company. The 360 and 370, the Series/1, the System/38, the System/36, the 8100, the RT PC and several variations on the IBM PC create a complex matrix of incompatibilities.

There were two primary reasons behind IBM's multiplication of architectures. In the first place, the antitrust suit initiated by the U.S. Department of Justice in 1969 was aimed at breaking up IBM into several smaller companies. In part to minimize disruption should the suit be lost, IBM organized a company structure that could be divided relatively easily. Different business units with separate markets and separate product development organizations then developed different architectures.

Perhaps more important, however, was that by developing new incompatible architectures, IBM could price more aggressively against competitors in selected markets — small business, for example — without undercutting its own relatively higher mainframe prices.

Software incompatibilities prevented users of larger IBM mainframes from moving applications to the more aggressively priced smaller systems. In this way, IBM was able to preserve higher margins in the much less competitive mainframe market while more aggressively pricing systems in more competitive markets. But now, faced with a growing challenge from Digital Equipment Corp.'s top-to-bottom unified strategy built upon the VAX architecture, IBM's proliferation of architectures has become a growing liability.

The recent announcement of the 9370 line signals an effort on IBM's part to push the 22-year-old 360 and 370 architecture down toward the desktop. Despite having told its customers for the past year that the System/36 was the key to its departmental-distributed computing strategy, IBM is obviously turning back to its original single architecture from 1964.

How successful this effort will be remains to be seen. The number of large IBM customers already using the System/36, 38 and even 8100 architectures, the rather long delays before 9370 product availability and the inroads into IBM's accounts being made by DEC and others add up to continued challenges for IBM in its effort to reunite the beads of mercury scattered by its proliferation of system architectures.

Challenges from competitors in distributed systems and networking alternatives must also be faced by IBM. Here, IBM's Systems Network Architecture (SNA) is unquestionably the main weapon in the arsenal. By providing a moving compatibility target for other vendors, IBM's continually evolving SNA helps to keep competitors off balance. The IBM Token-Ring network, more cross-system products, more peer-to-peer options within the SNA framework and a strong emphasis on network control are secondary means that IBM can use to keep customers in the fold with SNA.

As long as IBM accounts remain committed to SNA as their dominant networking strategy, IBM is able to gain a major advantage over competitors and limit competition. However, growing support for nonvendor-specific networking alternatives, such as Open Systems Interconnect (OSI), supported by many vendors and users and organizations like the Corporation for Open Systems in the U.S. directly challenges IBM's ability to control accounts through SNA. The gathering momentum of universal standards undermines IBM's ability to create its own proprietary standards.

As a result, IBM is moving inexorably toward full support of and commitment to industrywide standards. With the option of an Ethernet (IEEE 802.3) interface with the 9370, for example, IBM is recognizing the ultimate inevitability of universal standards. Increasing standardization of the information systems environment goes hand-in-hand with increasing commoditization.

The final major challenge for IBM is to find ways to return to a more rapid growth track. More rapid declines in the average price/performance in information systems are not being met with sufficient demand elasticity to sustain historical growth rates in IBM's traditional markets. At the same time, growing competition is driving margins downward. So IBM needs to find new sources for revenue and profit growth.

IBM's purchase of Rolm Corp. and minority interest in MCI Communications Corp. are aspects of one of IBM's most significant efforts in this direction. Communications, historically not a large factor in IBM's business, is one of the more promising possibilities.

Thus far, IBM has not enjoyed very conspicuous success in this regard. Its stake in MCI was the result of what was at least a tactical retreat from the money-losing Satellite Business Systems (SBS). And the Rolm acquisition has certainly had its share of difficulties. Nevertheless, communications fundamentally offers what is probably IBM's best chance for major new growth opportunities. Some enhanced network services, initially somewhat successful in Europe, are likely to be reintroduced to the U.S. market as well.

Another area that IBM seems to be exploring actively for future growth potential is systems integration services. Companies like Electronic Data Systems Corp., recently acquired by General Motors Corp., and many other smaller competitors have shown this to be a high-growth and high-margin business.

IBM has recently given the organizational unit that had been successfully offering systems integration services to the federal government the charter of developing a commercial systems integration business. Offering such services to large customers has the added benefit of increasing IBM's involvement, hence control, in large accounts.

IBM's industry position is more seriously challenged today than it has been for several decades. The company's current difficulties in maintaining historical trends in financial performance are likely to continue for some time and may get worse in the short run. There is no reason, however, to conclude that IBM will not be able to meet these challenges as it has in the past.

To do so, however, will require basic

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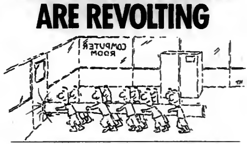

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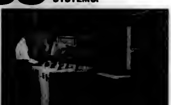

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COMMENT

> What is going on here is a historical shift of glacial proportions and power, although at a rate considerably higher than glacial speed. Even IBM, large and powerful and dominant as it has been, cannot change the course of events.

structural changes at IBM. IBM will need to become more aggressive in pricing as well as more innovative in product introductions. To do this, the company will need to undergo major structural changes. Not only must IBM drastically reduce its cost base, but it will need to simplify the present multilayer organizational structure to make it more responsive to the changing market.

What is going on here is a historical shift of glacial proportions and power, although at a rate considerably higher than glacial speed. Even IBM, large and powerful and dominant as it has been, cannot change the course of events.

So the real key to IBM's success will be managing through the period of transition and emerging transformed and renewed with brighter prospects. There is ample evidence that IBM management is quite aware of the need for this transformation and has been taking steps for some time to prepare for it.

The acceleration of the conversion from lease and rental to outright sales was not motivated primarily by the short-term boost to sales and earnings that it provided, although that was certainly a significant side effect. The essential motivation of that conversion was to position the company to be better able to respond to the opportunities that new technology is offering.

It is hardly surprising that some of the forms new technology has taken and its effects were not completely understood in advance and that the present period of transition is proving more difficult than expected. The impact of basic innovation is, historically, one of the most difficult things to predict accurately. Even profound and innovative geniuses are shown by history to get it wrong, at least as far as the specifics go.

The recent incentives toward early retirement at IBM and other measures taken to reduce levels of expenditures are much more than a temporary expedient in response to a temporary situation. IBM's management seems to be increasingly aware of the need for major restructuring that will make the company a much leaner and more responsive organization. The company can be expected to take further steps to reduce costs throughout the organization and to become a much lower cost producer in terms of total expenses, as well as in direct manufacturing costs.

Multiple layers of management are almost certain to be permanently reduced and simplified and corporate staff functions eliminated and consolidated. Even research and development is likely to be whittled down and more deliberately focused.

By the early 1990s, IBM will be ready to be both more aggressive in pricing and more innovative than it has been in the past. Once the present period of transition is behind it, there is every reason to expect that IBM will be prepared to exercise, much more dynamically, its market leadership.

Zachmann is vice-president of research at International Data Corp., a Framingham, Mass.-based market research and management consulting company.

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EXTRA

FOUR USERS TELL HOW THEY ARE DEALING WITH IBM

[illegible] CHARLES LAROCQUE

KAILASH KHANNA
American Express

WILLIAM PASSAS
Hoffmann-La Roche

JOHN PUTNEY
TIAA/CREF

TOM KULL
Dow Jones

Mastering a relationship with IBM takes both tenacity and a deep understanding of the general business climate as well as a company's own specific technical needs.

In order to better understand the relationship between IBM and its customers, *Computerworld Extra* gathered four top MIS executives together for a roundtable in New York. They discussed their individual working relationships with IBM as well as the benefits and frustrations of dealing with such a dominant supplier.

The four participants are Kailash Khanna, vice-president, corporate systems and technology for American Express Co.; William Passas, director of information systems for Hoffmann-La Roche, Inc.; F. Thomas Kull Jr., director of computer services for Dow Jones & Co.; and John Putney Jr., executive vice-president, office and information systems, for Teachers Insurance and Annuity Association. They spoke with Senior Editor Glenn Rifkin and *Extra* Editor George Harrar.

Has IBM's recent financial slump affected your working relationships with the company?

PASSAS: I've been an IBM customer since 1964, so I've had 22 years of continuity with IBM and watched them since before the 360 up to the current offerings. The only change that I've seen is that the software in IBM's realm has gotten so complex and so disjointed that it is a major problem that IBM has to overcome.

DEC, with its monolithic and continuous line of software, has gotten a big jump on IBM. The cost is in maintaining that software on the IBM mainframe, of having to maintain a relatively large systems programming staff and to get all of these pieces to work together.

Are you feeling more pressure from IBM lately to buy more or sooner because of the slump?

PUTNEY: I'm not.

PASSAS: I'm not either. I think their cost pressure has put fewer people in the field, especially in the systems engineering support area. In the old days, we had more support from systems engineering. Their moving 2,500 people out of headquarters office into the field to do sales support is probably a move in the right direction.

PUTNEY: I've found that, in general, IBM's presence has gotten lower and lower over the years. There always has been and still is a direct relationship on IBM's part between what the base they've got or expect to be able to get is and the coverage they give you, from a marketing point of view.

Even though I'm an IBM shop, a decent amount is not IBM equipment. And even the last three of four mainframes I bought were used computer equipment. In terms of our total expenses and capital expenses, less than half goes to IBM and most of that is maintenance. In capital, it's significantly less, maybe 15% this year. And this year it's primarily for upgrades.

From a systems engineering point of view, they've gone to other ways of supporting you, providing phone numbers to call and other places to get information. This, by and large, works pretty well. But the net effect is less of a one-on-one presence, and therefore their knowledge of what we're doing and their ability to get in and sell and understand what we're doing has diminished.

You'd think just the opposite would be going on, that the sales force might get more aggressive, especially where they see there is IBM interest, but you are buying used equipment.

PUTNEY: You can't turn it on and off. You've got to know enough about an installation to know what the hot buttons are and to know what to work on. If all these other trends mean you don't have that ongoing presence, then for IBM to jump in and say,

■ CONTINUED ON NEXT PAGE

■ CONTINUED FROM PAGE 9

"Hey, we've got this great new announcement," you react, "Oh, really?"

KHANNA: Our emphasis is on a different plane because of our size. We are 11th or so in installed base and have similar ranking in IBM's annual business from its customers. So we're somewhere in the top 10 or 20 overall. We've also been in the top five or 10 in growth rate. The emphasis we have is not on them trying to sell us because we will buy IBM equipment in relation to the growth of our own business and customer needs for processing. The emphasis is more on establishing strong alliances, on their having to focus their technology thrust on our business needs.

> If IBM had support of VM up and down the line, I might have much more seriously considered the 3090 and still would if they instituted that.
>
> — John Putney Jr.

What kinds of alliances?

KHANNA: For example, as we bring the advantages of digital image for storage and retrieval, we would prefer to have it done with IBM aystems integration and IBM's own equipment if they could solve that through manufacturing rather than to totally integrate other products in our IBM hardware and software. The same would be true with expert systems and any new technology, such as voice recognition. Those are the areas in which we would like to establish greater focus, thrust and energy.

On the pure purchase side, we've been working with IBM and spending a fair amount of energy on trying to simplify worldwide the relationship between the two companies. They're selling worldwide, we're buying worldwide and we have just a horrendous amount of complexities to cope with, depending on the country, the region, the discount tables and so on. So we are saying, "Why can't we coordinate this global purchase at top levels in both places and simplify this business?"

Is IBM cooperating in helping to find a purchasing solution?

KHANNA: They are being very cooperative. They are being very prudent and businesslike about it and are listening what we have to say. Being the size they are, it takes longer. We would like for it to go faster. But I would say, by and large, they are responsive to listening and trying to sort it out. They don't necessarily come out all the time with things the way we would like them to be. But they are always listening and incrementally coming in and being more responsive to large users.

PUTNEY: What I said before may be a little unfair. A good deal of the decisions you make on equipment are tied to software. We're a VM shop. And though IBM has said they have committed themselves to VM, in many ways the use of new features and error correction aren't in that. And the 3090 is not a practical alternative to us because the software doesn't support those new features in a meaningful way, if you look at what function you are getting for the dollars.

If they had support of VM up and down the line, I might have much more seriously considered the 3090 and still would if they instituted that.

KULL: At Dow Jones we haven't seen as many of the problems that you say they are having because through our growth and through our circulation DP center, which recently started installing IBM equipment, we finally qualified as a national account under IBM. Any increase we've seen in support and marketing efforts really have come from the recognition that our volume has grown.

Is dealing with an IBM salesman similar to dealing with a Hewlett-Packard Co. salesman or Digital Equipment Corp. salesman?

KULL: That's interesting. We just had a change in our DEC representation. IBM has always asked for a desk in one of our offices, just to be on-site and get to know the business. Ironically, the new DEC rep on-site is an ex-IBM salesman, and one of the first things he did when he came in was say he wanted to have a presence; he wanted to have a desk when he came into the building so he could get a feel for where the business was going.

He pointed out that if they are going to make any inroads into the IBM part of our business, they are going to have to understand what our data administrator does and what some of the business applications are.

PASSAS: Your comment about the DEC salesman is interesting. Ten years ago I was interested in some DEC equipment, and I called up the sales office and asked them to send a salesman over. No one ever called or followed up. They were not responsive at all. Currently, I find the sales organization at DEC has improved substantially. They are on-site, they know about our business, they know what we are doing internationally. And they are much more responsive than they used to be.

The IBM salespeople we've invited to bid on several situations, and they lost because they couldn't address the software question. In another case, their legal department has given restrictions on nondisclosure agreements to the point where they can't even bid.

So that'a a change I see occurring in IBM. They don't have the solutions. Fortunately, there's a lot of third-party

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software out there for applications, so we're out with the third parties and not buying from IBM. That'a a big dollar area that IBM is missing out on.

But you are makiog the transition from Honeywell, Inc. to IBM in terms of hardware.

PASSAS: Yes We have a very large Honeywell base, so we have to spread some of our risk. Long term, we have some questions as to how viable Honeywell is going to be. They announced talks with [NEC Corp. and Groupe Bull] and we're not sure what direction that's going to take.

Is the sheer size of IBM In some ways a major disadvantage? They can't respond to you as fast as they would if they were smaller?

KHANNA: Yes. As large a customer we are of IBM, we account for less than a fraction of 1% of their total sales. And it'a hard to get any kind of responsiveness. IBM has massive sales power.

That power can be used two ways. It is good for the U.S. I'm glad that we're a dominant conveyor of this technology throughout the world. But this power can also be a disadvantage if they find that no customer or group of customers is big enough for them to bend. They'll work out their own policies and procedures as they see fit. It brings in some inflexibilities.

> I'm really disappointed that IBM lets a product like VM SF come out on the market that is half a loaf.
>
> — Thomas Kull Jr.

PUTNEY: I don't think it's the local office or an unwillingness to respond. It's the key decisions that are made at headquarters and wind up driving a great deal of what they do.

And I'll go back to software. I'm what is described as a VM bigot. I believe there is a great deal you can do with VM. It gives you the ability to truly have networking and IBM gave it to you long before a lot of the other ones that are now being talked about, including DEC.

But within the IBM structure, MVS is where the money is and has always been. Regardless of what has been said, when it gets down to really spending the money and implementing things, it keeps going to MVS.

They don't really understand the direction that the industry is going. We've got less than half — actually 37% — of our CPU power in batch work. If I look at just daytime, it's only 14%. The rest is teleprocessing.

Twice as much of our time during the day is spent on transaction processing, and four times as much is on interactive processing and time sharing. So what we're after is software that allows us to get to data and allows for performance on an on-line basis. Yet I really believe that in terms of IBM's structure, they are doing statistics based on large batch environments, and they keep viewing the world through MVS.

Meanwhile, data is the key. A great deal of the explosion in the information industry is and will continue to be the need for more people out there to get at data, whether it be with PCs or with terminals hooking up to minis or mainframes. IBM is missing that boat by continually pushing MVS.

If you are asking about them being aggressive, once again, they've pushed like crazy to get everybody to go to MVS. I resisted it in the past, and I hope this time it still works. Because a lot of us feel that VM and teleprocessing in general get lost in the ahuffle.

PASSAS: We have a similar mix at Hoffmann-La Roche in terms of on-line vs. batch — probably 70% on-line and only about 25% batch. We have a similar observation. The advent of office systems requires more interaction than ever before. That's becoming a very popular application because of the long-term payoff.

KULL: Jack's [Putney's] comments were interesting, because we just had a VM expert from IBM's Kingston, N.Y., office down because I was very disenchanted when I found out that when we converted to MVS/XA and we put VM SF on the aystem that we couldn't run CMS. I was looking to CMS as one of the tools we would use in our interactive processing. Although IBM assured us that that product is coming, they wouldn't commit to anything Basically if we said, "by 1990?" he'd say, "Oh, sure, we'll make it by then." But we weren't getting any dates.

Then he said, "VM is for your interactive processing, MVS" — they didn't quite call it batch, they called it "your transaction processing, your CICS." I have MVS bigots and I had VM bigots on the technical staff, and I don't know enough about either to be a bigot about either one. But I firmly believe that we are going to need both VM and MVS to satisfy the needs of our corporation. I'm really disappointed that IBM lets a product like VM SF come out on the market that is half a loaf and not have a firm timetable when the rest of the loaf is going to come out.

PASSAS: We took a short-term strategy, which said we would run VM with CMS and MVS XA under VM XA. That's what we're doing now.

KULL: I refuse to pay the extra software license. I'm holding out. I said I want it free until IBM comes up with CMS under VM SF. I don't know if I'll get it.

PASSAS: It's a significant cost. We're running it because we have particular applications we need to support with it, primarily Oracle Corp. or our large international clinical trials system. So we're paying that freight in order to wait for some of these things to come out.

How flexibile is IBM lo terms of pricing in either hardware or software?

KHANNA: Not very.

PASSAS: On software, very, very little. On hardware, very little. Their published prices are the price, and that'a why so many people are out on the third-party market. They can negotiate a little more out there than they can directly with IBM.

KULL: We have to have a full-time person just reviewing the bills from not just IBM, but all hardware and software vendors, especially when they are charging by machine. If we paid IBM what they billed us, especially when we were going from four machines down to two machines and so on, we would have blown our budget. I don't think it was intentional on IBM's part. But I can't imagine with the number of machines American Express has . . . you

■ CONTINUED ON PAGE 12

The participants

KAILASH KHANNA

Khanna spent 15 years with Trans World Airlines and American Airlines in a variety of systems and operations research positions before joining American Express Co. in 1979. In his current role as vice-president, corporate systems and technology, he oversees American Express's huge diversified worldwide information system. He is responsible for functional coordination and support of the information and telecommunications systems, assessment of new technologies, volume procurement and information and office systems services at world headquarters.

To support more than 70,000 employees worldwide and nearly $12 billion in revenue in 1985, American Express operates 16 information processing centers, 10 worldwide data and time-sharing networks, more than 85 mainframe computer systems (mostly IBM) and more than 400 minicomputer systems from various vendors supporting approximately 30,000 terminals.

The office systems at corporate headquarters, for example, are Wang Laboratories, Inc.-based. The major business unit of four, Travel Related Services, uses globally distributed large- and medium-scale IBM processors running MVS/XA with VM and TPF used for time sharing and credit authorizations.

According to Khanna, a few subsidiaries have installed Amdahl Corp. or National Advanced Systems Corp. mainframes, but "it's safe to say that 90% or more of our MIPS are coming from IBM."

Last month, another business unit, Shearson Lehman Brothers, Inc., opened a state-of-the-art information services center in Manhattan with nearly one million square feet of space, an IBM 3090 Model 400 and an initial offering of 216 MIPS.

TOM KULL

Kull is director of computer services for Dow Jones & Co. He is responsible for all computer service functions, including business systems, plant production systems as well as office systems.

Dow Jones is broken into three data centers, each with separate reporting structures. Among Kull's responsibilities is overseeing all processing for the production of the company'a flagship product, *The Wall Street Journal*. The two other data centers handle circulation and electronic two-way publishing.

While Dow Jones is Digital Equipment Corp.-based in its editing, reporting and production side (as are many newspapers), the company'a business operations are heavily IBM, with two used 3081s and a host of IBM and Memorex Corp. direct-access storage device and communication products filtered throughout the corporation. A centralized operation, the business processing emanates from Dow'a South Brunswick, N.J., center.

Corporate headquarters in New York, however, chose Computer Consoles, Inc. (CCI), a small Waltham, Mass.-based company, to provide its office systems rather than IBM. Kull points out that the CCI equipment interfaces with the IBM environment.

Dow Jones also publishes *Barron's National Business and Financial Weekly* and a host of other newspapers and publishing ventures.

In addition, the company offers the Dow Jones News Service, which produces three business and financial newswires and Dow Jones/News Retrieval Service, a computerized interactive retrieval service that provides access to data bases containing business, financial and consumer news and information.

JOHN PUTNEY

Putney is executive vice-president, office and information systems, for the Teachers Insurance and Annuity Association/College Retirement Equities Fund (TIAA/CREF).

Putney manages TIAA/CREF's extensive computer operations, applications systems and technical support functions and is responsible for projecting the company'a long-range teleprocessing needs and priorities.

TIAA/CREF, with more than $50 billion in assets, is the *fully funded*, fully vested, portable pension system for colleges, universities, independent schools and related nonprofit educational associations in the U.S.

Corporate headquarters in New York is IBM-based, with a variety of mainframes including a 3081, three 3083s, one 3033 and two 4341s. The system runs IBM PC-DOS under VM, and Putney points out that his organization is very heavily into teleprocessing, far more than batch applications. There are, he says, nine terminals for every 10 TIAA/CREF workers.

Most of the IBM equipment was purchased on the used market. Outside of the mainframe area, there is a mix of equipment including Amdahl disks, Harris Corp. terminals and Xerox Corp. printers.

WILLIAM PASSAS

Passas, the director of information systems, recently joined Hoffmann-La Roche & Co., the $4 billion international pharmaceuticals and health care services firm renowned for the development of several breakthrough medicines including Valium.

He is overseeing major changes in the systems area including the conversion from a Honeywell, Inc. mainframe environment to an IBM one. The company is taking delivery of a 3090 next year along with expanding its use of DEC equipment. Hoffmann-La Roche is currently converting to IBM equipment because Passas is concerned about Honeywell's future in the computer business.

In addition, Passas has implemented a system for the company's northern New Jersey installation allowing IBM Personal Computer users to hook into an AT&T System 85 network in order to access a new IBM 4381 mainframe.

■ CONTINUED FROM PAGE 11

probably need a staff of people just to check IBM's billing.

KHANNA: Any effort spent on scrutinizing the bills submitted by any vendor is very cost effective.

IBM is not billing you accurately?

KHANNA: The administrative systems that IBM has for billing and keeping updated on all the changes that the users make can't handle the task accurately. There really is a lot of equipment involved from terminals to other higher level machines.

KULL: When I first went into the computer department, a 3276 was coming up off a two-year lease. And one of my administrative people said, "We don't know where it is. We think we sent it to Massachusetts. But the Massachusetts office tells us it is not in the office. What should we do?" I said, "Let's just cancel it when the two-year lease comes up."

So we cancelled it. All of a sudden a freight bill showed up from IBM for shipping it back to them. My people said, "What should we do?" I said, "Pay the freight bill; then it's up to IBM to figure out where the equipment is."

Eventually when people were digging out a back room warehouse, they found the 3276 in Chicopee, Mass., and we finally told IBM where it was. But this is how messed up their billing was. They sent us a freight bill for something just because we said to cancel it, and we hadn't even shipped the machine.

What is at the root of these problems, in-house politics, for instance, at IBM?

KHANNA: There may be some of that, but IBM has many constituencies: customers, shareholders, various countries in which they operate. So major decisions and major turns take very deliberate time and speed. That, to a certain extent, slows down their response time.

When you asked about flexibility in price, to me that means whether IBM is willing to negotiate on an individual basis and strike a price that you may not offer to the next person. And there, the inflexibility is paramount because IBM appears to have a policy of wanting to be able to go to each customer and say, "The same package of goods thet we offered to you, we offer the next person and the next person." It makes it extremely hard.

We've talked to one large user who refused to pay full retail price on IBM hardware. He didn't get a discount on the machine, but IBM gave him a million-dollar break on his maintenance contract.

PASSAS: DEC does something similar. They will not cut the price on their machine, but they will compensate for thet in terms of services they offer.

With IBM, what determines whether you get that kind of deal, sheer size?

PUTNEY: Or whether it's near the end of the year, and they're trying to make quota.

PASSAS: One of the major challenges of any director of MIS is to get the company's value out of IBM. Because if you've dealt with them long enough, you know what will turn on the support and how to go into the organization and get the support. Many directors don't really take advantage of the support you can get from IBM, if you play a little bit of hardball.

How much does IBM get involved with helping you set up internal MIS policies and practices?

KHANNA: We bring together all the senior systems executives within American Express once a year and have an exchange with IBM's senior product managers and senior management. We have exchanges on any major hardware or software directions. So that helps. But that's not focused on any specific project within American Express or IBM. They tell us where IBM is going, and on the flip side we tell them roughly where we think we're going.

PASSAS: We have a similar effort. In the U.S. we're primarily Honeywell-based, but in Basel, Switzerland, we have a 3090-200, 3081, 3033 and 4381. So we have a major effort of just communicating software standards between our office in Basel and our headquarters in Nutley, N.J. To be able to just exchange information beck with the differences in the operating systems is a substantial task.

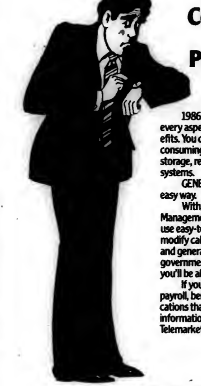
KULL: The type of briefings I've seen IBM do recently, at least for the Dow Jones staff, are more to cement decisions IBM has already made. In other words, if one of our sister DP departments has 4381s and is deciding whether they are going to make the break out of the 4381 line and get into the 3090 line, IBM will take them to a briefing and tell them what the 3090 is and where is it going to go.

PASSAS: Also, the complexity of the line now is so huge. I used to know every item, every number, the specifications on every item in the line. Today that is an impossibility. You can't keep up with the number of announcements and the options that you have.

I believe there's a need for simplifying the line and what they are offering. When they are redesigning everything on a two-year cycle, and your tax laws say you can write it off in five years or more, it creates a significant problem in terms of managing this hardware.

How do you deal with that rapid change?

KHANNA: It's a case of how simple you want to make the terrain look. On the surface, it is hard and there are all these spec numbers to jump over. But if you just take a helicopter ride up high you could say that — particularly in our case — the main information factories are running and will continue to run on MVS/XA. So the outside service to tha customer world will be through the MVS/XA.



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When you bring it inside, you say, "We've got 75,000 employees, how are we going to serve their needs?" My contention is that the game is very confused, whether it's IBM or any other vendor. None of them has yet brought together a compelling architecture that will serve this very complex need.

There's VM; there's Wang VS, strong in word proccessing and allied office activities; DEC claiming a lot of architectural simplicity and harmony, strong in time sharing, but not rich enough in applications. Then there's IBM offering the cooperative processing to make it all work in their product line.

> If you just take a helicopter ride up high you could say that the main information factories are running and will continue to run on MVS/XA.
>
> — Kailash Khanna

When you look at the professional, the manager or the secretary, I don't think we have yet fully understood all the activities and flexibilities thet they want and need.

There has to be a shakedown in technology and application software.

PASSAS: The overall standards as an industry still aren't there. What if the electric power company were to come out with a 157-cycle standard suddenly as a competitor. Well, they just wouldn't be able to make any penetration at all. Yet we have all these small vendors who come out with a different set of interfaces, and we're spending a sizable amount of our time just trying to reconcile interfaces between different products. That's one of the major reasons we feel we have to standardize on one, two or three vendors.

Is IBM pushing hard for you to switch to the System/36?

KHANNA: They've stabilized the 8100. Naturally, they would like to have the System/36 be the replacement, and we're looking at thet along with others for the functions that 8100s are performing.

In terms of saying what will end up being the office architecture, there isn't any certainty or clarity at the moment. In my mind, there is no clear winner. When we extend the requirements beyond word processing, we want the total flexibility of the VM world for the professional, we want the secretaries to have the sophistication and the advantages of the Wang; and then all the data can be exchanged back and forth, and we can have storage to the extent it is cost-effective.

I don't think we have a fully satisfactory operating environment anywhere yet.

What drives your buying decision in the PC area?

PUTNEY: Compatibility. I want to make sure the same interconnectivity and ability to get the data is going to be there. And the safest bet to do that, frankly, is IBM.

PASSAS: I'm making an investment decision. I'm saying I have to write that piece off for four or five years. You've seen some vendors come up with a so-called compatible clone, and they go out of business after two years. What happens to your investment? We have an IBM standard for thet reason. Plus we see the packages available for an IBM operating system are just incredible in terms of the number, the type thet come out, the changes to them. The other vendors just aren't changing that fast.

What about Compaq, for instance, with the 386-based machine?

PASSAS: The 386-based machine doesn't have the software out there. Not yet. You are going to have to wait for that to develop. By the time that develops, IBM will be out there with a 386-based machine.

KULL: We have standardized in the sense that it's MS-DOS or PC-DOS. We have not been able to get a large discount from IBM on their PCs. Also, we found that some of the performance on the Compaq and ITT in particular has been better for what we needed to do. So we've asked people to stay within the MS-DOS area but it doesn't have to to have an IBM label on it.

What does American Express do about its PCs?

KHANNA: We adopted a policy of IBM compatiblity, basically approving MS-DOS and SNA connectivity and discouraging non-IBM. The two concerns now are, first, what are the productivity gains or advantages of this investment in certain pockets where daily usage is limited? With the amount of training time needed and the costs involved, some of the machines seem to fall into the fringe, nice-to-have type areas. And the second concern is the security aspect.

Are we keeping sensitive business information in a position where it could be walking away on a diskette?

PASSAS: We have that concern as well, plus the classic problem of how many copies of the same information do you now have? Or almost the same information? How do you manage that? And how many people work that information for their own purposes instead of relying on a central copy data base? I'm thinking that in five or 10 years, people will have a PC on their desk, but it won't have a floppy and it won't have a hard disk on it. They'll download their programs from the mainframe and work with their data in the machine and really have a conversation with a departmental processor, possibly, or a mainframe.

That means end users relying

■ CONTINUED ON NEXT PAGE

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■ CONTINUED FROM PAGE 13

on centralized MIS again?

PASSAS: Well, they are coming back anyway.

PUTNEY: It never changed with corporate data. If you're going for outside data, that's fine. If you've got your own data, fine. But if you go to corporate data, the controls that are necessary within a company to see that data is right, DP is the only place that does it. They are really charged with it as a major responsibility.

KULL: The information within a company is growing faster than we can probably all imagine as a valuable resource, especially a company like Dow Jones, which sells information.

How close do you let IBM get to the end users?

PUTNEY: In general, I don't think they do, and I probably prefer that they don't, but I'm not even sure we've ever said not to. Unless your decision making is application driven, there's no particular reason for a user to be after equipment. If you've got people coming in selling software, by all means have them talk to the end user. But that in turn drives some equipment decisions that will filter back to us anyway. But IBM, for example, doesn't really sell many applications anymore.

PASSAS: That's probably where IBM is losing out. They used to sell you an application and the equipment used to come with it. And now they are trying to sell equipment and the applications are falling down somewhat.

IBM is saying that capital spending is down on the user's side and that is the cause of the current slump. Do you agree?

KULL: I think the used market has affected IBM more than anything. We were able to grow in MIPS without growing in budget. There's more alternatives of where to buy MIPS from and different ways, if IBM won't deal with you, of getting it at a price you want. As most companies, Dow Jones has been emphasizing controlling the cost of operations. We've been able to do that and provide more processing power. And it may be a little bit at IBM's expense because of the way the marketplace is going.

PASSAS: The purchase/lease ratio 20 years ago was 63 to 1, today it's 15 to 1. IBM has converted its entire rental base to purchase and put s tremendous amount of asset value out with their customers. Now they are only leasing or renting 10% of their product. I think they made a strategic error when they did that because they lost control of their customers.

PUTNEY: We can talk about whether the shortened life cycle of equipment causes us problems. The reverse of that is if you say, "I'm not going to let it cause me problems because I'm not going to run through the hoop. I'll start to go to used equipment or other things that were in that old life cycle but now are a lot cheaper." The net effect is that IBM is trying to force that faster cycle to maintain their growth. But a lot of users are saying, "Our cycle is fine." The net effect is we still have equipment that would have been perfectly fine years ago and the same life cycle. And it's cheaper. So unless you give me a major reason or function, there's no reason for us to jump on that new cycle.

By staying with used equipment, do you lose out on leading edge applications?

PASSAS: Price per MIPS of a 2-year-old piece of equipment is cheaper than the new line every time.

PUTNEY: I don't think leading edge is going to be mainframes. That's part of the problem. Leading edge is going to get out to things like terminals and data base machines. It's going to be nonmainframe.

We're at the point where you just can't completely change, no matter who wants to, the way you do things with mainframes. You've got so much software, so many people, so many changes we've made in terms of maintenance that if you want to do something quickly at the leading edge, you can't be tied into the overhead of changing your mainframe. You've got to be able to zero in on particular things that are aimed at applications and whatever hardware and software are needed to do it.

> We're at the point where you can't completely change, no matter who wants to, the way you do things with mainframes.
>
> — John Putney

KHANNA: Where we have gone into the Sierra [3090] series — and we've been an aggressive buyer of them — it has been predominantly for the need of a large single image. So we have gone essentially for the need for 27 MIPS or the 50 MIPS, as opposed to saying we need it just because it's the newest. We also have a large collection of the 308X equipment. The pressure for new technology is more in the applications side, for delivering customer services, in cutting down cost, rather than just installing the new direct-access storage device line or the new mainframe. That's not the leading edge.

PASSAS: Most of our key applications are in the research and development for new drugs. That's our single largest use of computers today. Doing basic research, taking it through the clinical trial process and bringing a new drug to market. We are spending s lot of money to make that process faster, more accurate.

One of my criticisms of IBM is that we hear rumors of what their announcements are going to be. But it would have been nice to know two years ago what those announcements might have been, so we could have taken advantage of that planning for two years. IBM is whipsawing us with these announcements all over the place. A large company, like American Express, probably has better insight into what IBM is going to be doing, because they tend to be a beta-test center.

Why doesn't IBM give you that advance word?

PASSAS: It's a hangover from a legal issue that goes back 20 years in terms of not preannouncing. I don't know why that restriction still exists, considering they won the antitrust suit, not the government. And most other vendors are preannouncing.

PUTNEY: One of the things that did happen after the lawsuit — they are giving statements of direction on things like the office environment. The problem is they may be giving s conceptual direction, but the details of exactly what and when leave something to be desired.

Kailash [Khanna], you used the term "partner" when talking about IBM before. Do you consider yourself a partner rather than a customer?

KHANNA: It's a varied record. There are some American Express subsidiaries that are very pleased on that count and there are some that are not as happy. We have a relationship with them that runs both ways. They are also a customer of ours for a variety of our products. So when it comes to the institutional relationships, it's on both sides. To some extent we look at our relationship as a partnership from the standpoint that we both rely on each other for a variety of services and products.

Take the SNA network and its development. We were among the earlier partners with IBM on that, and our worldwide network of SNA is second only to IBM's in size and traffic. In that sense, we have learned and shared, and they have been instrumental in the telecommunications data network that we have within the travel-related services company. We are, of course, a bigger customer of theirs in total dollar volume than they are of ours.

The emphasis on IBM as such, or the comfort level that it may bring, is not as much as it was in the past. We have very sophisticated and learned senior management, and their emphasis is on service and the cost of delivering that service.

We are a multivendor shop already. And both we and our executives are looking and saying, "Are we getting value and service from a vendor to whom American Express is giving s significant amount of business?" So it's more the issue of value. In terms of a business partnership with IBM, we're not talking, at the moment anyway, of joint ventures to my knowledge. But who knows?

PASSAS: At Hoffmann-La Roche, because we are a multivendor shop, I find that my management is very knowledgeable in terms of the differences in technology. They've made it their business to do that. Their orientation is in two areas — one is in price/performance. Are we getting our money's worth in the equipment?

And two — the people. As we go from a Honeywell to an IBM environment, our chief executive is really concerned that the people who are IBM trained or Honeywell trained become proficient in the technology of both vendors.

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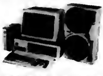

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If you could ask IBM to provide three or four things that would make your work a lot easier, what would they be?

PASSAS: Basically, an easy-to-install and maintain operating system that is tiered down to the office automation and development center architecture, that has a monolithic or at-least consistent perspective to the user.

KHANNA: I'll add on to that discounts on software. A stronger alliance in the application of the technology to users businesses.

PUTNEY: I think VM already is an architecture that provides a great deal of cross-system flexibility, and we've made a great investment in it.

I would like IBM to actually do what it said in terms of support of VM.

And early in the announcement cycle, support VM in terms of using new features and functions of the equipment and providing better error correction.

The second is that I would like to see some combination of software and hardware to do office functions, such as storage of libraries and the ability to take a great deal of what is in the desks of today's offices and get them out on the computer.

KULL: I agree with Bill [Passas].

I'd like to see IBM play their cards on what is really going to tie the PC up to the mainframe. What are going to be the one or two operating systems that let you go up and down?

If you need to do personal computing or departmental computing, IBM should provide the tools, because if they don't provide them, there are other vendors out there who can provide some of those solutions. They are going to start losing out.

Also, if I could get CMS on VM SF tomorrow, that would give me some options I don't have right now.

How do you describe your relationship with IBM?

KULL: We're a lot like Kailash [Khanna]. We're both a customer to IBM and IBM is a customer to us. They're certainly one of our major advertisers.

We look in our data publishing area to IBM as a partner, in terms of the things they are doing with new terminals and where that whole field is going for selling information electronically.

But at the same time, from a personal standpoint, IBM isn't giving me the direction or information that I need in my position to determine where they are going.

We've been forced, and maybe for the best, to look at the other vendors for applications support.

PUTNEY: I have no problems with IBM. The industry has evolved to a point where we can't expect anyone, including IBM, to support all of our needs.

You have to look at many other places for the applications software, and the fact that IBM exists and has set so many standards provides a tremendous base of people you draw on who can provide the direction you need.

I mentioned a few things I think they are holding us back on. I certainly would like to see those things changed. But overall, even with the shortcomings, we've been able to grow a tremendous amount with what already exists.

We've got nine terminals for every 10 people. I'm not using that number as a goal; they're there because people are using them.

We've been able to create an infrastructure where professionals and office workers as well as the development people and the operating people can use them. On balance, I'm not unhappy.

KHANNA: The extent and diversity with which we depend on IBM equipment and software and applications to deliver our products and services is testimony to the fact that it is, by and large, a happy and satisfying relationship.

We've been talking about and bringing out areas where improvements are needed and that is always fruitful.

So we haven't spent time talking about the great and satisifying things they do in supporting the various data centers, which they do very well.

In that sense, as a counterbalance, it's a very satisfying support environment, and we're escalating and challenging IBM to come and support our businesess with the new technology and take leadership in that whole arena on a global basis and deal with us on procurement on a global basis.

There's almost a flip side to saying it's a full-time job to keep abreast of all the changes.

The flip side is there are not enough changes happening in these major wish list items for the whole computer industry.

You sort of wish some of these problems we've been talking about for the last five years had been taken care of by now.

I'd like to see IBM spend a lot of resources on turning out expert systems, but let's get some of the basics in the traditional DP side done first.

PASSAS: Generally, we're satisfied. IBM continues to be one of the best managed companies in the U.S.

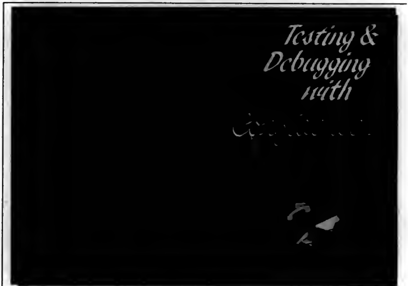
Their R&D organization is superb, probably second to none anywhere in the world, and I think the company needs to take advantage of the strengths of that organization to help enterprises such as Hoffmann-La Roche.

We have an excellent relationship with them. They are particularly attentive to us since we are doing a conversion from another vendor. So we're able to negotiate some support that we might not otherwise get.

Is there a best time to buy from IBM?

PASSAS: We're getting into the pattern of waiting until the end of February because their price drops tend to occur in February now, so that anything you negotiated in December was wiped out in February.

Since they don't offer price protection for six months, I think the next order I give them is going to be phrased "deliver the machine immediately after your next price cut."



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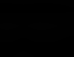

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CIRCLE READER SERVICE NUMBER 170

EXTRA

BY AARON GOLDBERG

HOW MUCH WILL IBM DARE TO CHANGE ITS PC?

With the introduction of its 80386-based system in mid-1987, IBM will take the first step down the path to leveraging the investment in mainframes — PCs.

ILLUSTRATION BY RALPH MARIELLO

IBM is in the process of making major changes in its Personal Computer line. While the initial product, an Intel Corp. 8086-based system, will be introduced in January, the real 80386-based system will not debut until mid-year.

This announcement around June will signal the beginning of the end for the clone market and will drastically change the rules of the compatible market as well. However, users will find that the new architecture will eventually enhance the role personal computers play in information systems management.

IBM must try to change its position in the market from reactive to proactive. These new products will give IBM the chance to show either that it can be aggressive and creative or that Armonk paralysis has finally invaded the Entry Systems Division, too.

IBM is segmenting its PC-type products into critical and noncritical sets. The low-end products could be killed if the business does not work for IBM, but high-end business is critical. For this reason, the company must find a way to do more than create a workstation from off-the-shelf components and a Microsoft Corp. MS-DOS. It is not so much a question of whether IBM realizes this situation — although it should already — but how it plans to address these issues and how good the implementation is.

By now the issue of Application Specific Integrated Chips has been brought into the open. The IBM-Intel joint development agreement was the first indication that IBM will not use off-the-shelf parts for the next generation of PCs. In addition, the use of operating software like Topview indicates that IBM will not rely solely upon a product licensed from Microsoft for the workstation software environment.

It has been rumored for months that IBM has been working with a number of independent third parties for software. Among those mentioned are Digital Research, Inc. and Meta Software, Inc.

Most crucial for the MIS professional is the level of integration between larger systems and the desktop that IBM is hoping to provide. The concept of three-tier computing, first iden-

■ CONTINUED ON NEXT PAGE

EXTRA

■ CONTINUED FROM PAGE 17

tified during the late days of the 1979 distributed processing revolution, is now becoming a reality. The problem for IBM now is disparate architectures and operating systems. The introduction of a 80386 workstation should start to provide the hardware platform that is needed to build complex software environments — like VM on the desk — in the future.

It is precisely the need to integrate the personal computer environment within the information systems environment that will make this next generation so important. Now, PCs typically exist like small, self-contained data centers, usually with little contact to the outside world, except for some manual re-entry of numbers that arrive in a printout format.

With the introduction of its 80386-based system, IBM will take the first step down the path to leveraging the investment in mainframes *and* PCs.

IBM is committed to providing a consistent user interface for different system architectures. Recent announcements highlight the desire for consistency from desk to data center, but that will likely take another two to five years to achieve, depending on what you consider integration.

The surface mount device (SMD) technology used in the PC Convertible would also be used for a new low-end system. This unannounced system (New-PC) will make heavy use of SMDs and have a large amount of custom very large-scale integration (VLSI), proprietary to IBM. The custom VLSI will not be used for the microprocessor, but every other function is fair game.

It appears that IBM will use some of its custom chips in the graphics controller. Graphics will be handled by silicon, with a proprietary graphics controller chip. Resolution of this new subsystem is expected to be astounding, and the interface could be similar to that of the Apple Computer, Inc. Macintosh.

This would appear to be quite a video system for such a low-cost PC. It may be that the system will be monochrome only. A color monitor by itself to support this super-high resolution would cost $600 to $1,000. In addition, the memory needed to support even eight colors with this high resolution would drive the cost way up.

The system is also expected to have most of the options built in. This means that the need to mix and match supposedly compatible products to get complete systems is likely to decline. The downside is that this setup will likely limit the amount of absolute saving attainable for some user shops.

> IBM is the master of its own destiny. If this new product set is as poorly implemented as the PC Convertible, the outlook for IBM is not good.

Two parts of the design are subject to speculation. First, the microprocessor used for the New-PC is expected, but not certain, to be the 8086. If IBM built its own version of the 80286, that microprocessor could possibly be used. Introducing a new low-end product now would certainly seem to be reactionary, and the product would almost certainly be short-lived. A low-cost 80286-based system, however, would certainly hurt the PC AT, and IBM goes to great lengths to prohibit cannibalism. The 8086 is a contender, especially if more processing power is needed.

The other issue is the amount of main memory. There is no information regarding either standard or maximum amounts. If the product is 8086-based, 1M byte may be the standard; if 80286-based, 2M bytes could be the maximum.

Diskette size is a curious question. Reports from 3½-in. floppy disk manufacturers indicate a huge ramp up by IBM, but changing the 5¼-in. standard would be difficult. Moving to a different medium size would be an easy way of differentiating the New-PC but would create compatibility problems.

The timing and pricing of the New-PC are somewhat unclear. It is known that IBM would like to target a sub-$1,000 entry point for the system. Yet, a fully configured system that will support very high

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■ CONTINUED FROM PAGE 18

resolution graphics and include a hard disk would be in the $2,000 price range.

Because of the impact this system would have on the PC and PC XT, the introduction might not be made until inventory levels of these two older products are low or nonexistent. But for maximum impact on revenue, as well as to cut off the compatibles, IBM should introduce the product in September. Despite the advantage of this timing, financial conditions might postpone the announcement until January 1988.

On the high end, IBM must maintain its position to compete in the computer industry longer term. Given the nearly complete stagnation of the standard and the fact that early 80386 systems will be merely turbo ATs — and the AT is merely a turbo PC — IBM now has the chance to do something innovative and exciting. This is its challenge.

Past performance has been extremely lackluster, and the result is a thriving clone community. IBM is the master of its own destiny. If this new product set is as poorly implemented as the PC Convertible, the outlook for IBM is not good. But if the same level of excellence can be generated as was witnessed in the first PC, the clones should beware.

Although much has been written regarding its 80386-based system, it appears that IBM will not be close to first in the market. This product is not likely to be introduced until late in the first quarter or the second quarter of 1987. One of the reasons will be lack of both an internally developed IBM operating system for this product and MS-DOS 5.0 from Microsoft.

International Data Corp. (IDC) expects that very high-resolution graphics will be used in the system, probably with a color monitor. There are rumblings that IBM would also like to use the 2M-byte, 3½-in. floppy disk drive, but these are not likely to hit until first-quarter 1987. Prices are likely to range from $6,000 for the most basic system to $10,000 for a fully configured product.

This system will probably have minimal backward compatibility with the present product line. It would be foolish, however, to expect IBM even to think about abandoning the DOS 2.X and 3.X base. Hardware add-ins are most likely to suffer. IBM is expected to make this a somewhat closed system in terms of cloning potential, but statements indicate that third-party software and allowable third-party hardware firms will be courted. If this system has the proprietary operating system , it could succeed in shattering, or at least damaging, the PC standard by creating multiple versions of the standard (Microsoft, IBM, DOS 2.X/3.X).

> IBM's biggest risk is in the low end, where it may create another PCjr. Unless the company comes up with a product that has complete backward compatibility, the market will turn its back on IBM and leave it with another inventory problem.

This is also the system that IDC expects will first embody the IBM promise of multiple-system access from a single workstation. The advanced architecture of the 80386 will allow some of the environment mimicking that will be necessary for seamless integration with System/3X and 30XX large systems.

If the product follows the scenario outlined here, it is truly a risky proposition for IBM. Even if the system is executed perfectly, it is questionable whether users will give up the openness of the present PC standard or want the feature set IBM puts into the system.

The operating environment may be where the largest change occurs. There is some mention of running AIX (IBM Unix) as the master operating system with multiple DOS guest applications. This does seem like a huge amount of overhead for a low-end system, to say nothing of the intricacies of Unix. The combination could be feasible for future high-end systems, considering that the purpose of this system is to render prior PCs obsolete or at least outmoded.

Larger, more powerful PC products will have a VM-like approach, especially those using the 80386, which can support virtual memory and multiple operating systems. Also, subsets of large-system products like CICS or even VM might reside on the PC directing DOS, Unix and mainframe applications.

The critical issue is that DOS 2.X- and 3.X compatibility must be maintained, including a 5¼-in. disk drive. If IBM develops a great system with high-resolution graphics and interfaces to larger systems without backward compatibility, the product will fail. Incompatibility will only provide another PCjr. It has taken 10 years to move from 8-in. to 5¼-in. media, and the 8-in. base was only 2% of the size of the present 5¼-in. system base. End users have made a significant investment in the existing standard, and they will refuse to give it up to move forward.

This product set may also be the first in which Topview is a standard feature. Clearly, the graphics capability offers the chance to do windowing and support a "Macintosh-esque" interface. Topview may also be one aspect where custom VLSI is used. IBM has not given up on Topview and has even put more internal emphasis on the product. This may be its mainstream introduction. Topview will have to move to a bit-mapped design, however, to fit new hardware.

IBM has created a standard that is six million units strong, and any changes must be approached carefully. But the company must take some action or be willing to settle for greatly reduced market share. The scenario outlined here could represent a great triumph for IBM, or it could create PCjr II, ATjr, an incompatible graphics system and a pitiful local-area network server.

IBM's biggest risk is in the low end, where it may create another PCjr. Unless the company comes up with a product that has complete backward compatibility, including 5¼-in. drives, the market will turn its back on IBM and leave it with another inventory problem. Yet this is the market IBM must pay attention to quickly. This new system claims to be value added, but it must show it in an obvious way.

On the high end, IBM is a little freer to explore. Given the limits of DOS and the problems of Unix, maybe IBM deserves its own chance to write an operating system. If it manages to forget DOS 2.X and 3.X compatibility, however, this system will undersell the RT PC. From an engineering standpoint, this system is a critical long-term challenge.

Goldberg is vice-president of Microcomputer Services at International Data Corp., a market research firm based in Framingham, Mass. He has developed strategic implementation plans for end users.

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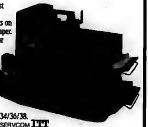

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EXTRA

BY STEVE PIGGOTT

SOLVING CICS PROBLEMS

CICS failures often come with no warning and attack formerly dependable systems. What's needed is intimate knowledge of CICS and associated software as well as a good performance monitor.

ILLUSTRATION BY RALPH MASIELLO

With an annual growth rate of about 20%, on-line transaction processing is currently the fastest growing segment of IBM's mainframe software revenue. Eighty percent of the revenue it draws from on-line transaction processing is accounted for by CICS, the 17-year-old teleprocessing monitor that boasts more than 25,000 licenses worldwide. While it is unlikely that CICS will, like a good wine, improve with age, its importance continues, and its future looks assured.

As the on-line work load increases at an installation, so the pressure mounts on the operations department or technical support group to ensure its continuous availability and to guarantee a consistent response time. The smallest problem can cause havoc and seriously threaten the profitability and efficiency of even the best-run enterprise. As end users become more dependent on computer-based tools, disruptions in their normal level of service increasingly affect their productivity.

As the editor of a monthly newsletter specifically aimed at helping CICS users throughout the world get the most out of their systems, I have the opportunity to read many articles describing problems encountered and ways in which the problems have been solved.

CICS provides a System Recovery Table (SRT) that contains a list of operating system abend codes that, if they occur, will be intercepted and cause CICS not to abend the entire region or partition but just the offending task. Although it has some notable gaps, many installations blindly accept the CICS-supplied SRT.

Graham Payne, a systems programmer with Lilly Industries Ltd. in Basingstoke, England, was faced with a CICS region that was frequently abending with an MVS abend code of U0203. This abend code is caused by a Cobol program attempting to divide by zero without the ON SIZEERROR option being specified and would probably not be considered serious enough at most sites to warrant crashing the whole CICS region. By simply including an

■ CONTINUED ON NEXT PAGE

■ CONTINUED FROM PAGE 21

entry for this abend code in the user section of the SRT, the damage that this rather basic programming error can cause can be confined to just the one transaction.

In a similar way — as John Bannister, a systems programmer with the Florida National Bank in Jacksonville, Fla., quite rightly points out — if the execution of a Cobol program reaches the end of the Procedure Division without encountering a STOP RUN, GOBACK or EXIT PROGRAM statement, CICS will issue a U0519 abend code and abnormally terminate the CICS region. Again, this action is probably not what most users would want to have happen and can easily be avoided.

The SRT is overlooked at many CICS installations, although there are probably other similar abend codes that could be added to it in addition to the two mentioned above.

Of course, the STOP RUN statement should never be used in CICS Cobol programs because it causes CICS to terminate (unless you are using VS Cobol II), albeit normally, if it is encountered.

It would be useful if the CICS command-level Cobol preprocessing program could be extended to check for potentially damaging commands and statements, although this extension would seem unlikely to happen in the near future.

Stephen Fry, technical support manager in the Central Data Processing Agency of Allen County in Fort Wayne, Ind., developed his own solution to this problem. He wrote a program that scans the CICS Cobol source code prior to passing it on to the CICS preprocessor and Cobol compiler.

In this way, he can check for the presence of statements like STOP RUN, any of the CICS Cobol restricted words and references to obsolete files or subroutines. Clearly this concept could readily be extended to make sure certain installation standards are being adhered to and to check that good programming guidelines are being followed.

A problem with the UNSTRING verb, which is on this list of CICS Cobol restricted words, presented itself to Donna Manley, manager of technical services for General Homes Corp. in Houston. Her previously stable CICS partition was getting frequent error messages indicating an inadequate GETVIS area.

GETVIS is an area of virtual storage that is set aside by CICS for use by the operating system when it is running under VSE, and it is used extensively in VSAM and VTAM processing. The MVS equivalent is known as OSCOR.

The amount of GETVIS available in a partition is determined by subtracting the value of the EXEC job control language statement, specified in the SIZE parameter, from the amount of storage originally defined for that partition.

UNSTRING was used in two on-line programs, both of which were heavily used and defined as resident. One of these programs had been amended during the running of the current CICS session to fix an urgent problem, and CICS had been informed that it was now to use the new version of the program.

> It would be useful if the CICS command-level Cobol preprocessing program could check for potentially damaging commands, although this extension seems unlikely to happen.

This change altered the program's status to nonresident. Each execution of the UNSTRING statement acquires 4K of GETVIS, and a pointer to this area is maintained. Unfortunately, when the program is reloaded, this pointer is lost and another 4K-area of GETVIS has to be acquired.

It was this frequent reloading of the program that used the UNSTRING verb and the acquisition of 4K of GETVIS each time that was causing more than the normal amount of fragmentation to occur and the subsequent shortage of contiguous GETVIS space.

It is not altogether surprising that among VSE users, the shortage of GETVIS is way at the top of the list of recurring problems. Unfortunately, as you will see, similar symptoms can have many different causes.

Graeme Lewis, a systems programmer based in West Germany, was puzzled when his once-reliable CICS system started to abend following a spate of "Insufficient GETVIS" messages. After a considerable amount of investigation, during which he even wrote a CICS transaction to analyze both the system and partition GETVIS usage, he discovered that the problem was caused by a number of VSAM files that had been defined with a primary allocation value that had become too small.

As time went by, the files had grown and were now spread out over a number of disk extents. This inefficient usage of disk space was the reason for the shortage of GETVIS.

When Ed Tomlinson, a software programmer at Rolls-Royce Ltd. in Lachine, Quebec, was faced with the problem of a lack of available GETVIS space, his immediate reaction was to allocate more GETVIS by increasing the size of the partition in which he was running his production CICS system.

This action is taken at many installations that assume, with some justification, that the increased demand for GETVIS has been caused by the natural growth of the system as the result of

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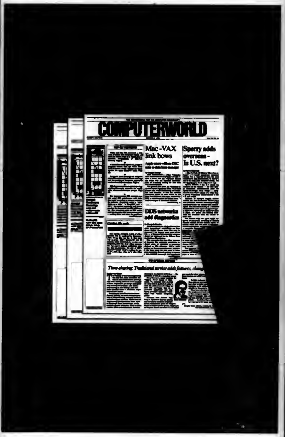
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increased activity or by the addition of new applications.

Tomlinson, using Candle Corp.'s Omegamon/CICS, a CICS performance monitor, and On-Line Software International, Inc.'s Intertest, a CICS program debugging tool, found that 1,280 bytes of GETVIS were used each time a program was fetched that was not in the dynamic area of CICS.

After a little more detective work, it was revealed that all the CICS Cobol programs had been compiled with the FLOW and STATE options. Neither of these options serves any useful purpose under CICS, but they had been made standard at Rolls-Royce for batch compilations. Removing these options and recompiling all the programs was enough to put his system back on an even keel.

At the majority of sites, systems maintenance is performed in the evening or on weekends. Even with the most exhaustive testing, faults are often not uncovered until the users get their hands on the system the next day.

Late last year, Thomas Czyz, director of technical support at Encyclopaedia Britannica, Inc. in Chicago, faced just such a situation. He added 10 new terminals to his CICS system on a weekend, tested them thoroughly and all seemed well.

The following Monday morning, users began to get some unexpected abends. Close inspection of the associated dumps pointed to a VSAM module, and IBM was soon contacted. Unfortunately, the VSAM support team at IBM was unable to help.

On further investigation, Czyz discovered that the problem went away whenever the 10 new terminals were placed out of service to CICS. At this point, he contacted the CICS support team, who suggested that the BUFSIZE parameter in the IPL (initial program load) SYS (system) statement was too small. It had been allowed to default to a value of 530, whereas the suggested value is nine times the number of channel queue entries (in this case, nine times 255, or 2,295).

This example excellently illustrates the systems programmer's need to have a working knowledge and understanding of the many different components of the system.

Kari Myllyniemi, the technical support manager at KY Assistor KB in Helsinki, Finland, was able to cut the terminal response times at his installation by a clever piece of lateral thinking, which could be extended to other long-running subsystems besides CICS.

He is an MVS user and copies his main CICS program library to a virtual I/O file prior to each CICS start-up. In this way, he can make use of the efficient I/O routines that virtual I/O uses to speed up the many program loads CICS performs during a session and could thus reduce terminal response times by one second.

Many VSE users interface with VSE/POWER spool files to provide their CICS users with job submission and printing facilities. They do so by using VSE/POWER's PUTSPOOL, GETSPOOL and CTLSPOOL macros.

Alfred Schaal, a systems programmer with RAFI GmbH in Ravensburg, West Germany, points out that each of these VSE/POWER macros uses a DOS XWAIT macro, which causes the entire CICS partition to wait during VSE/POWER processing. He avoids this overhead by replacing the DOS XWAIT with a CICS DFHKC TYPE=WAIT,DCI=SINGLE macro. This allows other CICS transactions, which would otherwise be waiting, to continue normally.

Many articles describe CICS system failures that have attacked hitherto dependable systems. Coming with little or no warning, it is just such attacks that can be so costly to a business. They illustrate not only the requirement for an intimate knowledge of CICS and its associated software but the need for a good performance monitor as well.

Neither of these should be underestimated or discounted on the grounds of price; in most installations, the waste and cost of having hundreds of end users staring at blank screens reduces the figure to insignificance.

Piggott is editor of CICS Update, *a monthly journal published by Xephon Technology Transfer Ltd. in England. A sample copy is available from Xephon at P.O. Box 4480, Winter Park, Fla. 32793. Piggott has 16 years experience working in an IBM environment and was a systems programmer in an MVS installation before joining Xephon.*

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EXTRA

BY KENNETH SONENCLAR

IBM WILL TURN AI TO ITS OWN ADVANTAGE

AI systems are enormously cycle- and memory-intensive, and IBM's main business is selling cycles and memory.

Since becoming commercially viable a few years ago, the artificial intelligence "industry" has largely been the province of small, high-powered start-ups such as Symbolics, Inc. and Carnegie Group, Inc. as well as a few old-line upstarts, such as Digital Equipment Corp., Texas Instruments, Inc., Sperry Corp. and Xerox Corp. Analysis of the AI market has normally omitted the computer industry's dominant supplier, IBM.

This situation is going to change. With unusual subtlety, and as a result of powerful market forces that have little, if anything, to do with AI per se, IBM is moving steadily toward turning AI to its own great advantage.

I define AI as computer systems that mimic human reasoning or sensing capabilities. Usually crowded under the AI umbrella are expert systems, voice recognition, speech synthesis and artificial vision. IBM has funded research internally and externally in all of these areas, as well as in robotics, another AI-related discipline. I will dwell here largely on IBM's efforts in expert systems, AI's most commercial segment.

For a long time, it was presumed by many that IBM had little interest in AI and certainly no coherent strategy for integrating AI subsystems into standard products, bringing AI-based tools and applications to market or winning market share. Several factors help explain this perception, at least in part. Foremost is IBM's own penchant for secrecy — specifically, its policy of not discussing unannounced products with the press. Equally important is that those who helped shape and spread the AI mythology earlier in this decade little understood IBM. For instance, Ed Feigenbaum and Pamela McCorduck's widely read 1983 book, *The Fifth Generation*, portrayed IBM as not only uninterested but actually hostile toward AI.

In addition, the hackers at MIT and elsewhere who became the shock troops of the AI industry and now populate the expert system vendors for decades viewed IBM's hardware environment as anathema, favoring DEC equipment and more recently, specialized hardware such as LISP machines.

Putting misperceptions aside, IBM will become a prominent player in AI for one overriding reason: AI systems are enormously cycle- and memory-intensive, and IBM's main business is selling cycles and memory. If the corporation hopes to meet its long-term annual growth targets of at least 15%, it must become a major supplier of hardware and software systems for AI applications in the office, laboratory and factory.

AI products and services must be examined in the same light as mainstream systems, although ultimate success for any vendor in the field will require addressing some of the unique aspects of AI systems, specifically the customization many systems require. But in terms of analyzing the market and IBM's chances, it makes the most sense to look simply at the traditional product groupings — hardware, software and services.

With the recent announcement of the 9370 line of downsized mainframes/superminicomputers, it makes the most sense to analyze IBM's AI hardware strategy by architecture. From that perspective, three stand out: the 370, the RT Personal Computer and the Intel Corp.-based PCs.

The limited size of the LISP machine marketplace (around $200 million in 1986) does not provide enough incentive for IBM to offer

■ CONTINUED ON NEXT PAGE

ILLUSTRATION BY RALPH MASIELLO

■ CONTINUED FROM PAGE 25

a dedicated symbolic workstation. Over the long haul, it seems quite reasonable that IBM will sell symbolic coprocessors as add-on devices for mainframes or plug-in boards for workstations. Such products are several years away, though.

In the interim, the RT PC family, introduced last January, is clearly IBM's AI workstation. The RT's role as an AI platform is certainly secondary to its position as a generic engineering workstation meant to compete with offerings from DEC, Hewlett-Packard Co., Apollo Computer, Inc. and Sun Microsystems, Inc. However, the RT's features — 32-bit processor, large memory, high-resolution graphics, support for Unix and industry-standard networking schemes such as Ethernet and Transmission Control Protocal/Internet Protocol are also what the AI market seeks.

Support from the independent expert systems tools vendors, that were tripping over each other to announce the RT as their next major port, as well as IBM's decision to underwrite development of Common LISP and Prolog environments for the RT, support my perception of the RT as IBM's designated AI machine.

The RT PC represents IBM's bid for systems that require the dazzling graphical interfaces the AI community has embraced with LISP machines and other advanced function workstations. Also, given the shortcomings of IBM's minicomputer offerings, especially the System/36, the RT could function as a departmental knowledge server.

At this point, it is critical to distinguish between the current reality and the promise of the RT. IBM has maintained to the press that it is happy with RT sales. If that is the case, no doubt its expectations were not great.

Even taking the fixes and price cuts announced in late September into account, the price/performance of the RT family moves it only onto the fringes of the competition. If IBM aspires to compete anywhere but at the low end of the marketplace — which is precisely where it does not want to be — then a sharp performance boost and a more cost-efficient method of doing advanced graphics are required.

Alongside the competition's boxes, the RT still comes up short in floating-point performance, graphics capabilities, memory expandability and especially CPU throughput. We still expect to see a CMOS implementation of the RT's proprietary processor by year end that at least doubles today's performance, as well as further memory expansion, perhaps up to 12M bytes — from the new top of 8M bytes.

Almost a year after its announcement, the RT is still not a practical AI tool. Interestingly, the RT's development was heavily influenced by AI academics at Carnegie-Mellon University. In fact, IBM is now funding 52 AI studies at 33 universities. Carnegie-Mellon, along with MIT and Brown University, continue to receive major IBM funding into research for hardware, software and communications for so-called "advanced function" workstations such as the RT PC.

The Common LISP IBM commissioned from Lucid, Inc. will not ship until December. Prolog from Quintus Computer Systems, Inc. is not available yet, either. As for the major expert system development environments, such as Inference Corp.'s ART, Carnegie Group's Knowledge Craft and Intellicorp's KEE, all report problems porting to the RT. None is likely to ship its tools before the middle of next year.

It would be inaccurate to credit IBM with an AI strategy for its family of Intel-based PCs — the PC, PC XT and PC AT. An installed base of more than five million machines — from IBM and the clone vendors — has been more than enough incentive for dozens of programmers to write AI tools and applications for the PC already, with hundreds more certainly waiting in the wings. The hang-up, of course, has been the limited power and memory capabilities of the machines themselves.

Those bones of contention will disappear when IBM workstations incorporating Intel's 80386 microprocessor, such as Compaq Computer Corp.'s new Deskpro 386, are announced.

We do not credit IBM with a strategy here because IBM expects third parties, always the principal providers of PC software, to retain that role with AI programs. While IBM has tried and succeeded to garner some of the multibillion-dollar PC software business itself by remarketing selected programs and writing some itself, independent third parties will remain the software innovators. IBM, Microsoft Corp. and perhaps others will provide the environment for countless developers dreaming of becoming the Lotus Development Corp. of AI.

Barring some massive shift in Fortune 500 purchasing patterns, moreover, the fact that IBM PCs are the workstations of choice on most desktops means they will be used to deliver the preponderance of expert systems.

The dominant part of IBM's AI hardware strategy will revolve around 370-architecture systems, both mainframes and now the 9370 superminis.

IBM's historic mainframe myopia will partly work to the company's advantage because mainframes for many reasons — not the least of which is that they are bought and controlled by IBM's best contacts in any company, the MIS organization — will indeed be used to build many expert systems. And remember that many large and important knowledge-based applications in many industries will call for tapping into monstrous data bases that reside on acres of tape and direct-access storage devices hung from 370 architecture systems.

Given its market power, IBM's push for 370-based knowledge systems is

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likely to succeed. A majority of corporate revenue is still tied to selling big machines. The mainframe mind-set is receding slowly as younger executives rise in the corporation and as the sales mix evolves. It is noteworthy, for instance, that domestic sales of "office systems and workstations" exceeded "processor" sales for the first time in 1985. Also last year, worldwide software sales of almost $4.2 billion showed the greatest year-to-year growth by percentage of any IBM product category.

Nonetheless, because much of that software is 370 software and because billions in peripheral sales are tied to mainframe installations, the company remains mainframe-oriented. Further supporting this world view is the fact that the company faces its least competition, enjoys its widest margins and exercises the greatest degree of account control in mainframes.

Still, IBM recognizes the shortcomings of the mainframe for certain AI tasks, as well as the far greater revenue potential of putting a PC on a user's desk instead of a 3170 terminal, and will use certain AI applications — especially those that require highly interactive graphical interfaces — to justify PC purchases.

> Alongside the competition's boxes, the RT still comes up short in floating-point performance, graphics capabilities, memory expandability and especially CPU throughput.

Except in the data base area, IBM has faced little competition in mainframe systems software. The corporation, of course, bundled systems software into hardware sales until a Consent Decree with the government ended this practice and for many years kept systems software prices very low. Today, prices are rising sharply, but potential competitors realize that IBM still considers systems software a critical element of account control and thus will pull no punches in defending that turf.

Languages such as Cobol have generally fallen under this classification, and the same should hold for the major AI languages: LISP and Prolog. IBM has had a LISP of its own making, LISP/VM, a product highly regarded in professional circles, on the market for more than two years now. It came out just a short while before the wagons started circling around Common LISP, though, and has suffered with the industry shift to thet de facto standard. A Common LISP for the mainframe is coming, most likely developed by a third party, probably some time next year.

Prolog/VM has been out for a while now. A Prolog for the MVS environment is not acutely needed and is probably not a high-priority item. Independent vendors will fill thet gap.

IBM's development environment for knowledge-based systems, Expert Systems Environment (ESE), is a relatively unsophisticated inferencing device for building expert systems on the mainframe, though it is certainly adequate for many applications. Both VM and MVS versions are available. It has not sold particularly well, though, for both technical and marketing reasons.

Technically, ESE is a relatively simple system, offering forward and backward chaining and the ability to assign weights to variables. It does have some severe shortcomings, specifically in the area of data base access, because interfaces for CICS, IMS and DB2 are needed if the product is to find acceptance in key vertical markets such as insurance. Ultimately, IBM will resolve the problem because the product has limited utility in production environments without it.

On the marketing side, ESE is only a Program Offering, not a Program Product. These IBM terms seem close but conceal an important difference. Program Offerings come with no assurance of long-term support from IBM. The degree of human and financial investment required to build large knowledge-based systems, however, demands long-term assurances of support. Steps are under way, I believe, to make ESE a Program Product, relieving user anxiety. Still, this apparently reluctant endorsement indicates that ESE is not yet viewed as the strategic product IBM will endorse over the long term for building expert systems.

I believe IBM's planners would like to port and support ESE across the product line (excluding the RT), stretching from the Intel-based PCs to System/36 and 38 and through the 370 architecture products in much the same way that Displaywrite has become the corporate word processing standard. So far the system has been difficult to shrink down to the PC, but work is probably continuing.

So far I believe IBM has sold fewer than 100 copies of ESE, which makes it a lesser light in the pantheon of expert systems tools. Boosting sales is certainly one aim of creating one of IBM's new Solutionpacs around ESE. For $67,500, IBM is bundling together ESE ($60,000) and $15,000 worth of expert-systems training and consulting. So the user who is intent on buying all of these products and services from IBM anyway saves $7,500.

Like any self-respecting vendor, IBM foresees multiple advantages in creating the AI Solutionpac. In particular, while a user might wish to purchase initially just the development half of ESE (the product is actually two programs — a $35,000 segment for developing expert systems and a $25,000 half for delivering them to end users, the so-called "consultation system"), that option

■ CONTINUED ON NEXT PAGE

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> IBM recognizes that it will find few technologies as lucrative as AI. The role of software is to fill up the machines out there so people will need more machines. And nothing fills up machines like AI.

■ CONTINUED FROM PAGE 27

is precluded with the bundled Solutionpac. Users who want the discount must buy both parts of ESE up front.

In addition, IBM realizes the market requirement of offering users wide-ranging assistance in developing sophisticated knowledge systems, and it is as eager to find out about user projects and needs as the users themselves. Finally, the makeup of the AI Solutionpac is another signal from IBM that it wants a larger share of the lucrative and growing market served by technical service organizations. Any large expert system is likely to require more than the consulting included in the Solutionpac, producing a healthy revenue stream over time.

The near term emphasis in IBM's AI software line will be on systems products, recognizing that tools are the dominant products in this early state of the market. Ultimately, though, applications will underpin a much larger market than tools, and IBM will seek its fair share — 40%, if you're looking at the world through blue-colored glasses. Early, internally developed applications in knowledge-based systems will likely be limited to domains in which IBM is indeed expert — in the DP/MIS area and perhaps in manufacturing.

IBM has gotten a lot of publicity in the data center area, courtesy of an interesting project called YES/MVS, an experimental system for monitoring the performance of large IBM mainframes. It has been under construction for several years now at IBM's Watson Lab in Yorktown Heights, N.Y. Although it might have some utility for entry-level MVS shops today, it is not yet close to industrial strength. Still, YES/MVS indicates one route IBM will take vis-a-vis homegrown applications — automating computer operations.

This same direction is underscored by tha diagnostics program for the RT PC and the configuration program for the System/38, both of which are expert systems. Other prime areas for expert-system modules include storage management and intelligent add-ons for data bases. IBM has already released a Cobol restructuring program that incorporates AI techniques, and I foresee IBM entering what should be one of the largest horizontal markets for AI-based tools: software development.

Alongside the homegrown software could well be a variety of independently produced applications for a wide variety of vertical markets. For instance, IBM could strike a deal to remarket expert banking applications — a la the recent accord with Hogan Systems, Inc. in traditional banking software. Such a possibility obviously awaits the development of such systems and is several years off. In the meantime, cooperative marketing arrangements with independent vendors such as Syntelligence, Inc., based in Sunnyvale, Calif., will become more common. Such agreements contribute to IBM hardware sales while reassuring faint-hearted users that IBM perceives value in expert systems.

As noted above, IBM has indicated its desire to secure more of the lucrative market for systems design, building and integration via such decisions as letting its Federal Systems Division bid on commercial contracts for the first time. The industry-specific and even company-specific nature of large expert systems dictates that many important, high-payback systems be highly customized to specific users. IBM is now addressing this need by opening Knowledge-Base System Centers in Cambridge, Mass., and Palo Alto, Calif., and developing a core group of expert systems builders.

The long term commitment of many large users to IBM hardware for traditional systems will ensure IBM a huge and continuous flow of orders for platforms to run and deliver expert systems, regardless of the software supplier. This was demonstrated in a New Science Associates, Inc. survey conducted this July of 28 large insurance companies. The companies surveyed account for more than half of all premiums written in the U.S. last year. The group revealed an interesting variety of approaches to developing expert systems. Indeed, some were engaged in highly advanced systems development using LISP machines and extremely sophisticated software environments. However, when asked who would supply the hardware used to deliver expert systems to end users, the responses were as follows: IBM, 62%; DEC, 4%; Xerox, 2%; and "don't know," 32%.

Not all industries will follow this pattern, and the ultimate purchases of tha insurers may be different. Still, the early indications from a bellwether group of companies are striking.

What does all of this add up to? In 1986, not all that much, in terms of products from IBM or revenue to IBM's coffers. Clearly though, IBM has decided that AI technologies are mature enough to receive its endorsement and an essential element of supporting future growth. IBM recognizes that it will find few technologies as lucrative as AI. As we've noted, IBM still views the world through a hardware company's eyes. The role of software is to fill up the machines out there so people will need more machines. And nothing fills up machines like AI.

IBM, however, is not about to stomp all over the competition, nor will it soon offer the array of AI products and services some users would like. Some business will go IBM's way regardless of what Armonk does; anyone who has ever attended a Share or Guide meeting of IBM users knows that too many large companies don't dance to any new technological tunes unless IBM is leading the band.

I believe that IBM will offer the toughest competition in 370-architecture AI systems software and data center-related expert systems. These are and will remain central to IBM's account-control strategy. It is always wise to avoid a direct confrontation with IBM, but new competitors with the right combination of technical and marketing savvy will win sales.

More important, the task of educating the huge IBM direct sales force in AI has just begun. This educational process will take a few years — a period of continuing opportunity for other vendors and a challenge for users.

Sonenclar is vice-president of research at New Science Associates, Inc. in South Norwalk, Conn. New Science is a research and consulting firm that specializes in emerging technologies.

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CIRCLE READER SERVICE NUMBER 161

BY BOB DJURDJEVIC

PRICE-PERFORMANCE WARS BREAK OUT — BUT NOT AT HIGH END

Price/performance is a total of a product's price, maintenance, software and other setup and operating costs divided by the product's relative performance.

If you still doubt that there is a correlation between competition and the price/performance of computers, compare the price/performance figures of the large systems market with those in the intermediate IBM systems area.

Between 1980 and 1985, price/performance in the IBM large systems market improved at a compound annual rate of 26%. By year's end, however, this rate is expected to show only a 3.7% gain (see chart).

Price/performance gains for the same period in the intermediate systems market averaged just more than 15% per year. In 1986, however, price/performance of these 4300-type CPUs is expected to jump to between 23% and 29% in list price alone.

If you compare the situation of these IBM CPU markets in 1985, it was reversed. The intermediate systems showed only a modest 5.2% gain, while the large CPUs' price/performance improved between 20% and 23%. The reasons for this reversal were changes in the level of competition as well as in IBM product cycles.

For example, in 1985, IBM's 4381s went practically unchallenged by competitors in the intermediate systems arena. As a result, IBM wasn't pressured to lower its prices. This year, however, that has changed.

Competitors like Digital Equipment Corp., NCR Corp. and others, not to mention the plug-compatible manufacturers (PCM) like National Advanced Systems Corp. (NAS), BASF Co. and Nixdorf Computer Corp., began to exploit the weaknesses of IBM's intermediate systems strategy. Last February, IBM responded by introducing the mid-life kickers to the 4381s, which lowered their price/performance by almost 30% [CW, March 24].

The large systems market, on the other hand, in which IBM had a decided advantage throughout the first nine months of 1986 — that is, the ability to ship a high volume of 3090s when the PCM vendors were constrained by slow production — was predictably lacking in serious competition.

One quality that most 370-type systems have in common, however, is their rising prices. If you are accustomed to reading about declining hardware prices, this may come as a surprise. But what is actually declining is price/performance, not the prices of large computers.

In 1980, a 9 million instructions per second (MIPS) 3033-AP was priced at just under $3.5

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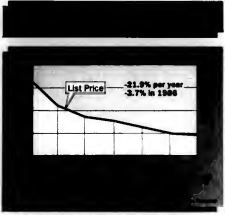
JEFF BABINEAU



Price/performance gains for IBM's large systems are leveling; 1986 figures are expected to show only a 3.7% gain.

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DUE TO A LACK OF PHOTOGRAPHIC CONTRAST
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DID NOT REPRODUCE WELL.

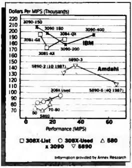
■ CONTINUED FROM PAGE 29

million. Today's largest mainframe, the 3090 Model 400, lists at $8.5 million and offers a throughput of about 47 MIPS. The 3090's price is roughly 2.4 times higher than that of the largest mainframe six years ago. Its performance, however, is more than five times greater.

The price/performance charts illustrate how the PCM products' price/performance compares with that of IBM's large systems. In interpreting them, take into account the definition of price/performance that these models incorporate: The price/performance of a computer product is a total of a product's purchase price, maintenance, software and other setup and operating costs divided by the product's relative performance. In other words, it is the cost of the relative performance unit (MIPS in the case of CPUs) that the product delivers.

Thanks to the success of IBM's 4381s during 1984 and 1985, the high-end 4300 market seems to be quite healthy. During the six-year period from 1980 to 1985, this market segment demonstrated a consistent growth pattern. The increases in the installed MIPS capacity averaged 40.6% per year, while the market value rose at a compound annual rate of 31.3% during the same period.

PRICE/PERFORMANCE — AMDAHL vs. IBM CPUs



IBM's 3090 Model 400 currently outperforms Amdahl's 5890 Model 300 by 15 MIPS. Amdahl's 5890 Model 600, with a release date of fourth-quarter 1987, however, is expected to boost the 5890 series performance to more than 60 MIPS.

Meanwhile, the compound annual price/performance improvement, prior to this year, was only a modest 15.7% per year, which means that IBM was able to effect wholesale migrations of the high-end 4300 users without having to give up a lot in terms of price inducements. In 1986, however, this picture has changed considerably, with 23% to 29% price/performance improvements being the norm.

Since the performances of the 4381 Model 3 and the 4381 Model 14 overlap with that of the low end of the 3083 product line but offer significantly better price/performance, the success of the 4381s has been in part responsible for the lackluster 3083 sales.

During the years, IBM has used performance boosts more often than price reductions as a way of improving overall price/performance. The 360/30, for example, a system that for about 10 years, from 1966 to 1976, represented the mainstay of IBM's lower mid-size CPU market, ranged in price from $200,000 to $250,000. Its successors, the 370/125 and 370/138, announced in 1972 and 1976, respectively, offered more processing power but were also priced in the same range.

The basic premise of IBM's migration strategy, therefore, has been to try to get the mid-size customer to write a check to IBM approximately every four to six years. Such a pattern continued in the 1980s. The list prices of the 4331 and the 4361 models, including the optional features, were still in the $200,000 to $250,000 range. But the strategies that worked for IBM in the 1960s and 1970s

■ CONTINUED ON PAGE 35

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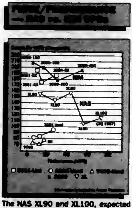


The NAS XL90 and XL100, expected in third-quarter 1987, may give IBM's 3090 Model 400 a run for the money.

■ CONTINUED FROM PAGE 31

are no longer bearing fruit in the second half of the 1980s.

The low-end 4300 market is one of the weakest IBM market segments. Despite a compound annual price/performance improvement of 22.7% during the last six years (see charts), the U.S. installed base actually declined in the last three years. From a high of 6,446 U.S. installations at the end of 1982, the number of 4331s dwindled to 1,845 as of the end of 1985.

Meanwhile, the U.S. population of the 4361s was only 3,203 — thus resulting in about a 1,400-unit shortfall from three years before. For the most part, the sharp initial drop of the 4331 installed base was owing to cancellations of IBM's short-term leases.

When IBM announced the 4300s in 1979, it also offered two-year leases for these CPUs for the first time. Their attractive short-term lease rates resulted in a high percentage of machines leased rather than purchased from IBM.

As of the end of 1981, 72% of all 4331s and 65% of all 4341s were on lease with IBM. That strategy worked well against the IBM competitors, but it also resulted in a large liability on IBM's hands — its rental inventory.

In 1981, IBM started increasing its lease rates and decreasing purchase prices for 4300 products. Subsequently, a number of users exercised the option to buy their leased CPUs at reduced prices using IBM rental accruals.

But more than 50% of them simply returned their 4331s at the end of the lease, resulting in net losses for IBM.

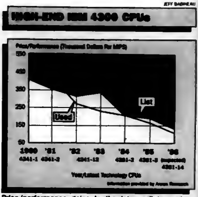
When IBM started shipping the 4361s in 1984, a new price/performance threshold was established for this market segment.

At the $220,000 per MIPS level, the 4361s offered slightly better price/performance than even that of the then-largest IBM processor, the 3084 Model QX. Two price reductions later, the 4361's $150,000 per MIPS price/performance at list is still attracting few buyers, as evidenced by the used market's price/performance of $70,000/MIPS.

The unprecedented 1985 special software discounts for mid-range CPUs, including the 4361s, of up to 33% — but only for buyers of hardware from IBM — were another indication of IBM's efforts to stimulate sales in this market. Yet none of it worked. Why?

Because IBM's 4300 strategists didn't understand the impact that IBM products would have on this product line, namely the System/34, 36 and 38 line. By the time IBM introduced the 4331, the System/34 had already become one of IBM's most successful products.

JEFF BABINEAU



Price/performance gains in the intermediate system market are expected to jump to 29% in list price alone.

In December 1980, Annex Research estimated that about 40,000 of them had been installed in the U.S. alone. The bulk of the growth in the low-end 4300 market should have been expected to come from the small system buyers, such as System/34 users, upgrading to a larger model.

But alas, such a move was nearly impossible, since the 4331s and the System/34 had different architectures and operating systems.

The growth of the low-end 4300 market dried up, therefore, because there was an insufficient supply of new entrants from the bottom. Consequently, moderate price reductions still left the 4361 above IBM's other systems' and the competitors' prices.

What IBM needs to do, therefore, is come out with an aggressively priced successor to the 4361 and position it as its departmental computer, running under VM and forming a part of its office automation strategy.

Djurdjevic is a computer industry analyst and president of Annex Research, a Phoenix-based computer research and consulting firm. He also conducts workshops on strategic planning issues for computer industry executives.

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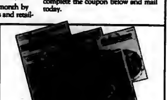

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THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

BY EDGAR F. CODD

INSIDE IBM'S RELATIONAL 'STRATEGY'

Ironically, IBM, which had to be dragged kicking and screaming into the relational approach, is now laughing all the way to the bank. IBM should implement a relational DBMS on every distinctly programmed IBM system.

The relational model for data base management was invented within IBM, and it was very strongly in IBM's interest and in its customers' interest for the company to develop software products based on it. Nevertheless, IBM has been one of the slowest firms to develop and market the products needed to support this model.

The decision to develop a relational DBMS product took IBM management longer to make than the decision to move into the manufacturing and marketing of electronic digital computers as products — and both decisions were really forced by competitors' moves. Remington Rand, Inc. announced the Univac early in the '50s; Relational Technology, Inc., Oracle Corp. and Dun & Bradstreet Corp. announced Ingres, Oracle and Nomad, respectively, in the second half of the '70s.

IBM's top management apparently does not realize that the future in computing and data processing belongs to software, with hardware playing a follow-on role — an implementation role. The sluggishness of its action on relational data base management can be attributed principally to the following problems in IBM, particularly in software development and marketing:

- A stick-in-the-mud attitude on the part of software developers and their line management: "I want to continue doing things the way I am accustomed to doing them."
- The assumption that IBM can take its time about entering any new market because it has such a large share of the existing market.

Associated with this attitude is the "Detroit syndrome."

- Extreme parochialism.
- The treatment of IBM corporate strategies as holy writ.
- A severe lack of knowledge of levels of abstraction.
- A severe lack of knowledge of predicate logic. Employees frequently and erroneously think there is nothing more to logic than propositional logic, often incorrectly called Boolean logic in the computer field.

The first problem is basically attributable to people being lazy about learning new ways of doing things. In many lines of work we expect this attitude, but in a field with such fast-paced development and change as the computing and data processing field, it continues to surprise me.

In the relational approach there are several sharp changes in the way data bases are managed. The four that the old-timers find most difficult to accept are:

- The use of domains (think of them as application data types) as the glue that makes a data base integrated, in place of hierarchic links or pointer-based network links. Domains, in contrast to links, do not jeopardize distribution of data into distinct, geographically separated sites or its redistribution.

- The change from single-record-at-a-time to multiple — in which multiple includes the special cases zero, one, two or more records, and none of these cases is given

■ CONTINUED ON NEXT PAGE

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special treatment.

■ The incorporation of a very powerful query capability into a general-purpose data base management system. Query systems used to be quite separate systems, often added on as afterthoughts, and many vendors claiming total solutions today still take this add-on approach.

■ The specification of integrity constraints linguistically in the DBMS catalog, instead of the old way: that is, structurally. This approach resulted in a serious interdependence between these constraints and the kinds of structures that the DBMS supported.

The Detroit syndrome takes its name from the car manufacturers in that city. These companies prospered for many years, and their top management became conceited and arrogant about its management skill and about the products those companies were producing. At the time of the first Arab oil crisis, they declared that their companies were unable to produce small, fuel-efficient cars at a profit. In California alone, it was not long before Japan acquired 50% of the new car market. Now, in the '80s, the Detroit manufacturers are beginning to change their old habits and manufacture fuel-efficient cars.

IBM has prospered for many years and has had good top management for most of its existence. However, from time to time it has adopted the approach of waiting to be second, or even later, to enter a market. Consider the following inventions and their usually attributed sources:

■ Stored-program electronic computers and von Neumann.

■ Virtual memory and the University of Manchester, England.

■ Transistors and Bell Laboratories.

■ The personal computer and Apple Computer, Inc.

■ The relational approach to data base management and IBM.

A noteworthy exception is the introduction of disk storage. For once, IBM was not only first in invention but also in marketing. In support of my argument, it is also worth noting that the IBM General Products Division, which manufactures disk storage products, is reputed to be the division that generates the most revenue for IBM now.

> After IMS was declared to be IBM's strategic DBMS, any internal proposal for a DBMS incompatible with IMS was treated as if it were a conspiracy. However, it is not within IBM's power to stop the process of invention.

The problem of extreme parochialism is another that has been present throughout my association with IBM, even when the company was much smaller. Individual employees somehow acquire the anomalous view that IBM is the entire computer field, and they do not need to know anything beyond whatever is required within their particular niche of IBM. Very few employees are aware of competitors' activities, the contributions of universities or the reaction of customers to various IBM products.

As one might guess, atrociously little attention is paid to technical papers in general and to non-IBM authors especially. This parochial attitude is encouraged by the fact that IBM places its manufacturing plants and development laboratories in areas so remote that even if employees wished to communicate with their peers in other companies, they are hard pressed to do so. Moreover, employee evaluation is itself parochial.

The problem of corporate strategies being treated as holy writ is a difficult one for IBM to solve. A corporate strategy is clearly needed by IBM in various key parts of the computer field in order to coordinate the activities of roughly 400,000 employees worldwide. Nevertheless, a corporate strategy developed in one year can conceivably be made obsolete a short time later as a result of an unanticipated hardware or software discovery or invention. Occasionally, communication within a company as big as IBM is so bad that an invention already made within the company makes a strategy obsolete at its time of birth.

This is what actually happened when IBM selected its Information Management System (IMS) in 1971 as its strategic DBMS product. After IMS was declared to be IBM's strategic DBMS, any internal proposal for a DBMS incompatible with IMS was treated as if it were a conspiracy to undermine IBM. However, it is not within the power of IBM or any large company or government to stop the process of invention.

To remain competitive, IBM must establish an internal communication channel directly from the lowest levels of the managerial hierarchy, where the inventions occur, to the top level. This channel can be very effective if there are explicit penalties for middle management if it attempts to block the channel.

The last two problems pertain to a severe lack of knowledge in regard to levels of abstraction and predicate logic. Employees in software vendor companies can no longer afford to be without this knowledge, and these companies, including IBM, have to solve these two problems swiftly if they wish to stay in the software products game.

DBMSs are systems that support the shared use of data — the kind of data formerly called formatted data, but now often called structured data, an equally poor term — without requiring either any scheduling in advance of execution of the actual sharing activities or any cooperative engineering of activities that are candidates to be mixed. The development of programs that depend heavily on exploiting data bases (data shared between numerous users who have conceived their actions dynamically and independently of one another, some in the development of application programs, others in terminal interaction) is rapidly overtaking the development of programs that access and manipulate private data only.

This clear trend still remains to be discovered by the following:

■ The language fraternity, including the developers and promoters of Ada and of the still-undefined class of fourth-generation languages.

■ The computer hardware and logical design fraternity, with the exception of the data base machine designers.

Early during the development of IBM's relational DBMS, DB2, the planning and design team was alerted by Chris Date and me to the fact that several important features of the relational model were missing from the specifications.

The omitted features included the declaration in the catalog of primary keys, foreign keys, domains, referential integrity and support for user-defined integrity. Further, the support for updating views was extremely ad hoc and partial — a direct result of the deplorable omission of the declaration of primary and foreign keys.

The response from the designers to our memoranda was lacking in technical foundation. They ridiculed the features in question as "religious" and "academic," which in their use of the words meant impractical and useless. An additional response was: "We could not have met our June deadline." My reply to this was, "If IBM can waste a clear six years (maybe more) before it put a serious effort into developing a relational DBMS product, what is the significance of meeting a June deadline? It is essential to do a first-rate and thorough job on this approach."

These designers had little or no experience in interacting with customers on the customers' sites. They now realize that the features they deliberately omitted are neither impractical nor useless and should have been supported in the initial release. DB2 was released after much field testing, but with "limited availability," in September 1984.

The early complaints and criticisms from users of DB2 were strongly correlated with those features of the relational model for which these designers had omitted support.

It is now 17 years since I wrote the unclassified IBM Research report RJ599 introducing many of the concepts of the relational model. During that period, no IBM employee has managed to come forward with any valid technical criticism. All of the criticisms from that source have been emotional or based on IBM's corporate strategy of the '70s. Some employees wasted a decade of their career fighting it tooth and nail, but not on technical grounds.

In sharp contrast, the System R team in the San Jose Research Laboratory, together with isolated people elsewhere, provided useful and well-conceived ideas that augmented the relational approach either abstractly or in implementation. IBM's late but substantial investment in the System R and R* prototypes has paid off already and will continue to reap substantial benefits for IBM. One principal benefit is that the product DB2, based on System R, has saved IBM from conceding the leading role in DBMS products to other software vendors. In fact, DB2 has given IBM a significant lead, in spite of its inadequacies at the time of release.

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commercially on the hardware side — especially in the development, manufacturing and marketing of disk storage — but it has struggled painfully in data base management software, as if it were trapped and unable to accept technological change. Its blind adherence to an absurdly low-level approach (that of IMS) has trapped IBM into spending large sums and manpower on the development of tools such as the Application Development Facility and the IMS data dictionary and on incremental improvements in IMS to keep IMS alive.

Technically, these tools were appallingly weak and poorly engineered, but the main source of the problem was the design of IMS: the complexities inherent in its use, the lack of effective support for the data base administrator, the serious exposure of users to errors and the unforgiving nature of the system in contrast to a relational system.

The declaration by top management that IMS was the strategic DBMS product gave rise to a strong reluctance on the part of most IBM developers to get into any approach to data base management different from IMS. After all, their careers could be damaged. A few proposals based on non-IMS approaches were attempted in the early '70s, but all were cut short, except for my activity in research — an under-the-table, one-man effort at that time — and a prototype project, the Peterlee Relational Test Vehicle, started in late 1971 in the IBM Scientific Center in England. This project was eventually squashed by IBM management in England.

> To win the struggle for the relational approach in the face of the IMS strategy-based dominance, it was necessary to create a public demand for relational DBMS products.

In order to win the struggle for the relational approach in the face of the IMS strategy-based dominance, not technical dominance, it was necessary to win the battle within IBM division by division, to publish enough substantial technical papers and make enough public talks — primarily in North America and Western Europe, but also in other parts of the world — in order to create a public demand for relational DBMS products.

An important additional goal was to spur a few people to invest in starting small companies with the purpose of developing relational DBMS products. Several such companies were in fact launched. Relational Technology and Oracle are just two of them.

It was 1976 before the IBM General Products Division came around to planning to develop a relational DBMS product, and even then it was unable to put a team of adequate size behind the plan and wasted another three years, chiefly because of IMS distractions. Eventually, in the '80s, the SQL/Data System (DS) and DB2 products were announced. Now came the battle to turn the marketing divisions around, especially the most conservative of them, those in the U.S. and UK.

The struggle over which approach to take to data base management was three cornered. In one corner was IBM with IMS, taking a hierarchical approach, as its prime DBMS product. In a second corner was the Codasyl Data Base Task Group (DBTG) with a network-structured approach. Members of this group included most of the major users, like AT&T, General Motors Corp. and the U.S. Department of Defense, and most of the major hardware vendors, including IBM. The DBTG leaders openly declared their intention of pulling off another Codasyl coup, like that when Cobol was made a standard.

I was in the third corner, alone from 1968 to 1970, but joined in spirit by two other IBM employees in late 1970 — Sharon Weinberg, located in New York and Chris Date, located in Winchester, England. These two people are today my partners in The Relational Institute in San Jose, Calif.

It was not until the first announcement of SQL/DS by IBM early in 1982 that I felt that IBM and I were finally on one and the same side of the DBMS fence.

Ironically, IBM, which had to be dragged kicking and screaming into the relational approach, is now laughing all the way to the bank. Some of the early customers using DB2 have started with the minimum hardware that supports DB2 and within a very short time, six months in one case, as a result of positive experience with DB2, have escalated their installation to the largest configuration IBM offers. This is an important reason why IBM should implement a relational DBMS on every distinctly programmed IBM system.

One large customer, an international firm and heavy user of IMS in several countries, recently stated to me after a year's use of DB2 that the company expects to develop more than 80% of its new applications worldwide on DB2. This particular case is interesting, because a year earlier two of the firm's technical people attended a series of lectures I presented in San Francisco and told me their firm was an early user of DB2, and that they had applied DB2 solely to information center use so far.

When I asked why they had not tried it on production data, they said they had proposed just that to their manager.

■ CONTINUED ON PAGE 41

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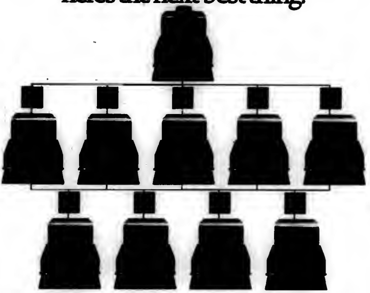

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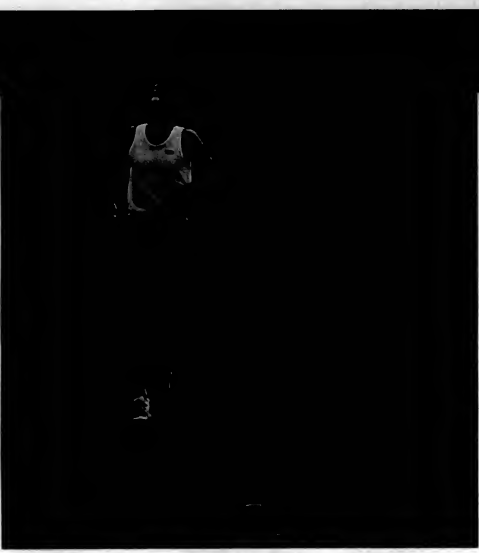

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His philosophy was quite simple, even in his earliest days. Not one to live by others' rules, he vowed to employ any tactic, embrace any product, use any technology, as long as it got the job done.

Several years ago, for instance, he was forced to move his entire IS/DP department across town. IBM told him the job would require at least a week of downtime. And that was all the challenge Dean needed. He rented rooms for his staff for a weekend at a nearby hotel, and accomplished the task between business hours Friday to Monday. Every one of his 700 terminals was up and productive Monday morning.

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Today, Dean is responsible for a staff of 150, and a budget of nearly $15 million a year—a good part of which goes to purchase the 300 micros (and attendant peripherals) he installs every year. And he reports directly to the CEO.

Dean is also an avid road racer—he runs some 60 miles a week—an active member of the BMW Car Club of America, and a world traveler.

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The manager's response was, "Before we do, I'll have to ask the IBM rep." A week later, the manager informed them that the IBM representative had advised him that DB2 was not intended to handle production data, and it should therefore be used on information center data only.

The manager accepted this advice and told these two employees not to use DB2 for production data — not even to try it on such data. My response was, "It is fine for a company that sells software to take responsibility for its quality, and I believe IBM tries to do this. However, who do you think is responsible for the profitability of your firm? Is it your firm or is it IBM?" They departed and evidently thought about it, decided to try DB2 on production data, measured its performance and found it perfectly satisfactory.

In early 1982, IBM announced its first relational DBMS as a regular product, SQL/DS. As an IBM employee at that time, I had seen in advance a copy of the announcement and found it seriously disappointing. The IBM management in the White Plains, N.Y., marketing headquarters was obviously planning on introducing SQL/DS purely as a query product for information center use — one more tactic to prop up IMS and DL/I where they were weak. I wrote an article for *Computerworld*, published to appear immediately after the IBM announcement, declaring SQL/DS to be the product it is and always was: a data base management system, not just a query product.

In the fall of 1985 [CW Oct. 14 and 21, 1985], I wrote a two-part article defining 12 rules by which to judge a vendor's claim that its DBMS product is fully relational. IBM's score for SQL/DS and DB2, seven out of 12, was good relative to the competition but quite poor considering the following:

- The relational approach was an IBM invention.
- IBM was the first computer company to develop a working prototype.
- IBM has poured a significant amount of money and manpower into the research and development of relational data base management.

Not too long ago, I made the statement to IBM that "it was irresponsible of IBM to put DB2 on the market with no support for referential integrity or user-defined integrity or integrity independence." There was no shortage of excuses in reply, but I did not find any of them convincing.

In Dallas in the fall of 1984, IBM organized and hosted a meeting of about 300 software vendors for the purpose of telling them how they could interface their products with DB2 and SQL/DS. This step was an excellent one for IBM to take, since it will help all parties concerned. An increasing number of products that interface with DB2 have been announced by these vendors.

A word of caution, however, for the user: It is possible for a software package on top of a DBMS to be unable to deliver the performance of the DBMS,

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EXTRA

■ CONTINUED FROM PAGE 41

due to certain kinds of counter-optimizing properties of the package. An example that comes to mind — and this is by no means the only one — is Dun & Bradstreet's Nomad package; its source language is the counter-optimizing feature.

In 1980 I felt that IBM should market its relational products with at least as much vigor as that given to IMS, and I am still of that opinion. I have never taken the position, either privately or in public, that IMS should be dumped by IBM. My position has always been that IBM should let the users and customers decide. With equal treatment by IBM marketing, the relational products would win hands down because the customers would, sooner or later, select those products that deliver the overwhelming economic and ease-of-use advantages.

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Since announcing DB2, IBM marketing headquarters has broadcast its "dual data base strategy," attempting to convince the public that it needs two different DBMSs to handle its data bases. Competitors have not been slow to capitalize on this by declaring in their advertisements: "Who needs two data base management systems?"

Only those firms that invested heavily in IMS need the two DBMSs, and then only during the period of transition — unless the firm has made the necessary sacrifices in productivity, data independence and adaptability to become an IMS Fastpath user, for which there is now no relational DBMS with a comparable performance.

No one is claiming that the transition from IMS to DB2 can completed overnight or should be. No one is claiming that it is simple and cheap to migrate application programs from one system to the other. However, the sooner the transition is planned as a step-by-step operation, the sooner it is started and the sooner it will be completed. In this way, the firm acquiring and using the new relational DBMS will make earlier gains in the following respects:

- A marked increase in the productivity of its programmers and users.
- Significantly reduced program maintenance costs.
- Sharply increased control of the data base integrity.
- Significant economies in time and money for application development.
- More round-the-clock operation.

The last item results from the significantly more dynamic character of the relational approach. Changes in the catalog contents (the data description) can be made without bringing the data base traffic to a halt. In fact, with sophisticated locking by the system, such changes can be made concurrently with ordinary transactions that merely change the regular data. These changes can entail dynamically altering the types and numbers of alternative access paths for any relations.

The one thing that gets IBM marketing off its hindquarters is competition. Almost all of IBM's competitors in the software field have chosen either to support the relational approach to data base management or to claim that their DBMS product is a relational DBMS. Although a few of these claims by vendors are ludicrous and result from questionable ethics, generally speaking the software vendors have been forging ahead in sales.

As a result, IBM marketing is beginning to awake from its long sleep. It is beginning, at last, to call for help from the few IBM employees in nonmarketing divisions who have real knowledge of the relational approach to data base management.

It is inherently difficult to discern what levels of abstraction are used in human problem solving and thinking activities. In the relational approach, we openly declare these levels. For example, the relational model is at a higher level of abstraction than any of the relational languages SQL, QUEL and QBE. People frequently ignore these declarations.

My experience with software developers and software salesmen generally (not just IBM employees) has been that most of them do not understand levels of abstraction. This means that they do not understand one of the principal objectives of superimposing a layer of software on top of the hardware or on top of another layer of software: namely, to introduce higher and still higher levels of abstraction.

I sometimes ask people who are skeptical concerning levels of abstraction whether they would employ a bricklayer to construct a skyscraper or whether they would ask a person to build a large suspension bridge if that person's only bridge-building experience consisted of positioning a plank of wood across a narrow stream.

Here are some of the steps I believe IBM should take as soon as possible:

1. IBM must find a way to manage software development in a leading mode, not a reactive mode. It must avoid a recurrence of the Detroit syndrome.

2. It must improve its internal communications and its evaluation techniques applied to software engineers to prevent the parochialism and bureaucracy of the past decades.

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> In the long run, IBM's strategy should be to incorporate numerous DB2 services and components step by step into MVS and VM.

3. It must start to take software design and engineering at least as seriously as hardware by its actions, not by talk alone.

4. It must find some software experts within the corporation and place them in higher level management. It should use outside help in evaluating the knowledge of these experts.

5. All employees concerned with software products should be instructed in levels of abstraction, application of that concept to software and increased use of all applicable mathematics.

An increasing emphasis should be placed on learning these topics and on avoiding ad hoc, seat-of-the-pants inventions and special casing — activities that result in incomprehensible software with a proliferation of special-purpose additions, where each addition represents a last-minute increment intended to solve one more small problem uncovered late in the game.

Points 4 and 5 should at least enable managers to decide on a more rational basis which software project proposals are worth pursuing.

Today, software developers tend to come up with many claimed new approaches that are, in fact, inadequately new. They do not provide any fundamental change.

There is a clear and urgent need to get all types of general-purpose computers to communicate with one another about their data bases, especially computers of quite different sizes.

In the long run, IBM's strategy should be to incorporate numerous DB2 services and components step by step into the large-scale operating systems MVS and VM. This approach will mean a gradual redesign for both of these systems. In principle, this work can be done without adversely affecting customer investment in applications programming and training. The main advantages for IBM are the following:

- ■ It would make MVS easier to maintain and expand.
- ■ It could improve DB2 performance even more.
- ■ Parts of MVS could be incorporated in hardware or firmware.
- ■ It could become more difficult for competitors to develop hardware clones of IBM mainframes and obtain a free ride with IBM software.

IBM has publicly declared that it intends to extend its relational software to provide full support for the relational model. I believe it should execute this step swiftly to protect its customers from additional significant changes in their application programs and to discourage the American National Standards Institute from continuing to standardize on too limited a version of the language SQL, which is what the present standard represents.

I do not want readers to go away with the idea that I can find nothing right with IBM. Looking back at that part of my career as an IBM employee, I feel positive about the following aspects at least:

- ■ In most countries in which IBM operates, it provides its employees with fair treatment and reasonable salaries and benefits, thus avoiding the problems associated with trade unions.
- ■ As a company, IBM operates with excellent ethical standards. Occasional departures from these standards seem attributable to particular employees disobeying the rules.
- ■ IBM has sound and fair internal rules for handling employees.
- ■ IBM has made, and can continue to make, some solid contributions to the computing field (a good example is disk storage, cited earlier) when its inventors and innovators are not obstructed by a strategy-based fixation.
- ■ From time to time, IBM has shown remarkable tolerance (not support) for counterstrategic activities, even though its tolerance was not outstanding in the particular case described in this article.

An example of adherence to ethical standards is that IBM refrains from misrepresenting its products to potential customers. Thus, there is no claim from IBM that it offers a "DL/I transparency" product, a claim that some other vendors are making and a claim that I believe is as technically infeasible as a product that translates correctly from assembly language to Fortran or Cobol. An additional example is IBM's claims regarding performance of DB2, which, in my opinion, are conservative.

For several reasons, IBM has a more difficult task than most companies. It develops, manufactures and markets a very wide range of products with a multitude of interdependencies among them, and most of these interdependencies are both intricate and unavoidable. The scope of application of these products is tremendous. In many cases, it takes a good degree of intelligence to understand just the application.

From the standpoint of the U.S., I believe that IBM represents a tower of strength in the world economy. It is a shining example of a company spawned by a country that emphasizes free enterprise, free trade, free speech and democracy. So, I hope those readers who object to my criticisms will use them to make improvements in the policies and methods of all hardware and software vendors, including IBM.

Codd is president of The Relational Institute in San Jose, Calif., and the developer of the relational model.

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BY HERB GROSCH

THE EMPEROR OF 'THE IBM'

You had a lifetime job at IBM provided you accepted any job offered you, in any location whatever, and thanked everybody concerned for the wonderful opportunity.

He would be 74 next month, although no one in IBM dared mention the number to him. The large and devoted family would of course celebrate — very privately and without emphasizing his age. In his sharp but nevertheless sentimental way, he was looking forward to the dedication next week as a major present — a recognition by devoted employees of his foresight, his vigor, his determination to make "the IBM," as he called his empire, an even more important leader in American and world business.

This was Thomas John Watson, "Mr. Watson" when addressed directly, "T. J." in most third-person references inside the company and nearby, "The Old Man" informally and pejoratively. The use of "Watson Senior" to distinguish the emperor from the heir apparent would not be in frequent use for another five or six years. Indeed, it was really a coined label for the convenience of the media and historians rather than something used in IBM.

It was Thursday, Jan. 22, 1948. Watson and his entourage stood inside the world's second giant electronic calculator. Three months earlier, the space had contained The French Bootery, a handsome and quite successful shoe shop catering to 57th Street ladies and would-be ladies. From the ground floor of the building adjoining IBM World Headquarters, a building owned or at least controlled by IBM, the Bootery had been summarily moved across the street and the cavern remaining had been miraculously transformed, with walls of plate glass and stainless steel shielding some 12,000 full-size vacuum tubes and 20,000 special relays.

Watson, his vice-presidents, sycophants and senior technical workers nervously awaiting judgment were clustered around the freestanding units on the raised floor of the lovely room. A little further back, a gaggle of less senior engineers and scientists were tensely watching the action, available to answer questions or to open and close panels and doors. The giant control unit, covered with hundreds of identical but handsomely labeled switches, was "manned" by Betsy Stewart, appearing quite at ease and in command of the situation. Behind her were attractively cased line printers, and fairly close by were repackaged punched-card readers, gang punches and some special units.

Questions were asked and answers were given; but none about money, for T. J. assumed others were seeing to it that enough had been provided and none wasted. Not much about the press; T. J. knew they would flock when he beckoned. Would the demonstration impress the important men and women who had been invited for the dedication? Would the IBM creation outshine the Eniac?

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17	37	87	77	87	117	137	157	177	187	217	237	257	277	287	217	387	357	377	387
16	96	96	76	96	116	138	198	176	198	218	238	258	279	388	218	332	358	378	388
16	36	96	76	96	116	139	196	176	196	216	239	259	279	296	216	239	369	378	386
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■ CONTINUED FROM PAGE 44

How would it compare with the machine Watson had donated to ungrateful Harvard back before electronics?

There was a pause. Those of us away from the center of Watsonian attention, standing near the inscription that offered the huge device to Science — over the famous Watson signature, of course — began to relax a bit. T. J. had not appeared to notice that the machine was not doing anything important, although those of us who had been close to him on other occasions could not be sure. He had eyes in the back of his head and the memory of an elephant.

> The giant machine we stood inside was arguably the brainchild of Wallace Eckert and John McPherson. But the prewar patents had been funded by The Old Man.

True, he was not supposed to understand much about electronics. On the other hand, *somebody* had supported a good deal of experimentation before the war and was authorizing the hiring of bright young guys from the radar shops of MIT. The recent upsurge, including the giant machine we stood inside, was arguably the brainchild of Wallace Eckert and John McPherson. But the prewar patents, now embodied inside the walls of the new calculator, had been funded by The Old Man.

Anyhow, there were no embarrassing comments. He assumed everything would be ready by next Tuesday. After all, he had ordered that it be so. We were not so sure, but we were all committed, seniors and juniors alike.

The emperor looked around one last time. The whole session, although vitally important to the fantastic future of IBM, had taken less than an hour. "A great credit to the IBM," he said, and all the vice-presidential heads nodded in unison. "Science will move ahead more rapidly. Our universities and our government will surely benefit, and world peace and world trade will be fostered as people from other countries visit and perhaps use the calculator.

"There is just one thing," he said, somewhat off-handedly. "The sweep of this room is hindered by those large black columns down the center. Have them removed before the ceremony." And out he marched, tailed by his quivering followers.

Well, we had four days, counting the weekend. But there was a slight complication: Those columns concealed the steel uprights that held up the 20-story building. Even for Mr. Watson no one could remove them. Now, that elephant memory was selective. Later that year I watched him order one of his most clever inventors, Pete Luhn, to build terminals and connect them to a big relay calculator "on a lower floor," so that the "research area" would be more attractive. Not bad in 1948 and from a 74-year-old. I later asked Pete what he would do. Would he propose a 100-man effort, abandon his current projects and set out after The Old Man's casual dream?

"No," he said, "He'll never mention it again unless I bring it up. Of course, if he gets mad at me about something else, even 10 years from now, he'll remember he told me to do it — and that I didn't. And tell everybody nearby I disobeyed a direct order."

The cooler heads assumed that T. J. would forget the whole thing. Cynics like me figured he just wanted to keep the troops on their toes; he knew very well those columns held the building up. On the other hand, nontech types who had watched the old boy in action reminded us newcomers that he might use noncompliance as an excuse to erase some poor soul who had "failed" him before, perhaps — looking hard at me — by omitting to invite someone to one of Mr. Watson's celebrations (I had just done the scientific invitations for the dedication).

Inspiration wasn't mine. There was to be a fancy brochure about the machine featuring a big centerfold view of the main area. We junked the whole stack and, over a frantic weekend, printed a revised edition. The centerfold photograph was carefully retouched, and all traces of the offending columns were removed.

I loved it; the semantics boys were right — there is Reality, and then there are representations of reality and layer upon layer of more remote imagery. The columns were still there on opening day, and they stayed there for the life of the machine and on into the golden days when a 701 lived there. A *Saturday Evening Post* story published later in the year has a fine colored illustration of the area, with the columns front and center. But the history books show a beautiful room without columns — the room Watson ordered.

What was I doing in the back of that room, and why had I been the one to work up the scientific invitation list for the unveiling of the Selective Sequence Electronic Calculator (SSEC)? It was the third giant machine of the Babbage line and, like the first, the ill-fated Automatic Sequence Controlled Calculator (ASCC) that Watson had had built to Howard Aiken's specifications four years before, it was to be dedicated to the greater glory of Science and — unlike the ASCC, now universally called the Harvard Mark I — to the glory also of the International Business Machines Corporation.

The second giant, and the first to use primitive 1940s electronics, had been

■ CONTINUED ON PAGE 46

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■ CONTINUED FROM PAGE 45

the Eniac, cobbled together by President Eckert and John Mauchly in the Moore School of Electrical Engineering of the University of Pennsylvania, in downtown Philadelphia.

Eniac added nothing at all to IBM prestige, although the builders had reluctantly used IBM gang punches as I/O devices. What it had done, by appearing on the front page of *The New York Times* — the first such device ever to do so — was to make The Old Man grind his teeth so ferociously thet people, dozens of them, shivered as far away as Endicott, N.Y., home of the IBM research laboratory.

> Good behavior included not growing hair on your face, not wearing colored shirts, not taking a drink in public and never contradicting The Old Man or his direct representatives. I did all four in my first two years in the company and for a while lived to tell the tale.

I was the second scientist ever hired by IBM and an anomaly in a dozen other ways. I had been a computer since the autumn of 1935, was an authentic member of the same tribe of scientists as Wallace Eckert and had responded instantly to the announcement in *Science* thet Eckert — no relation to President Eckert, by the way — had been hired in March 1945 to head a new Department of Pure Science in IBM and to establish the Watson Scientific Computing Laboratory at Columbia University.

Remember the name Eniac? That acronym stood for Electronic Numerical Integrator and Calculator. Almost every current article about that incredible machine, with its 18,000 highly fallible vacuum tubes and the thousandfold increase in speed it brought to major calculations, says "computer." But it wasn't so. From the mid-19th century until about 1952, a computer was a human being who did computations and associated technical tasks in laboratories and observatories. He — or more often, she (I married one) — used printed math tables and calculating devices.

The people who didn't do it full time, or who used slide rules and planimeters and such, usually didn't use the label. I did, and was quite proud to have been made a computer by a more experienced member of the clan in the mid-'30s. All the "c"s in Eniac and EDVAC and EDSAC and Univac stood for "calculator," which is what we computers used, along with Marchants and Fridens and Monroes and Brunsvigas, until the Defense Calculator became the IBM Type 701.

Eckert hired me in May 1945. The Watson Lab had been under way for months — and both the European and Pacific wars deliriously concluded — before the Eniac announcement. Although I had been busy shaping up and running the computing side of the enterprise, I had helped Wallace interview his second senior employee, a relieved refugee from Howard Aiken's sweat shop.

He was one of the two or three people in the world who had managed a giant machine — the one at Harvard. Aiken, the irascible boss, and Grace Hopper, nowadays everybody's favorite computer personality but then known principally as the coauthor of the handsome Harvard Mark I operating manual, were his only counterparts.

Eckert wanted Rex — Robert Seeber — because Seeber expected to build another giant. Watson had told him IBM intended to do so and had indicated vigorously how unhappy he was with Aiken and Harvard. Now, Eckert had good lines into MIT and, although not himself at ease with even old-fashioned electronics, knew that the new radar techniques developed so quickly there (and in Britain and the Bell Labs, neither of which were readily accessible to Watson and his business machines-oriented crew) would be the building blocks of future calculators.

In parallel to his recruiting Seeber and IBM's third scientist, Hilleth Thomas of Thomas-Fermi statistics fame, Eckert set out to pick up three or four youngsters, hot off the radar griddle, to work on long-range projects at the Watson Lab rather than in IBM shops in Endicott and Poughkeepsie, N.Y. He was not at all an empire builder, but it would have been good for IBM, and certainly for me, if he had been. He simply planned to stockpile some advanced technology against the time when Mr. Watson might need it.

When Eniac hit the front pages, he was ready with Seeber, but the pulse-electronics boys were not tuned up, and the SSEC had to be built with big bottles and old circuits. Out of that tiny specialized group finally came the Naval Ordnance Research Calculator (NORC) — the first supercomputer. It just took a while.

Watson pushed the "start" button. He picked Frank Hamilton, who had been No. 2 on the ASCC. "Put every IBM resource to work, Mr. Hamilton," Watson said. "I want the new machine to be faster than that one in Pennsylvania, more capable than the one we gave to Harvard. I want it to be installed here at World Headquarters in one year. And I want it to be available to the scientific world, not hidden away at a selfish university or at a military installation."

Frank realized how horrendous the task would be. But he was a big, handsome, forceful engineer — a natural leader, with a team in place in the Endicott laboratories and a clear idea of what other projects he could dip into. It was a great challenge. Besides, you did not say no to the boss — not when he gave you an, ahem, opportunity like that.

Although I did not yet see it clearly, this was my first exposure to the IBM Contract. During good behavior, you had a life job at nondecreasing pay and with great perquisites, ranging from membership in lovely dollar-a-year country clubs to suites on the Queen Mary, provided you (a) accepted any job offered you, (b) in any location whatever and (c) thanked everybody concerned for the wonderful opportunity.

Good behavior included not growing hair on your face, not wearing colored shirts, not taking a drink in public and never contradicting The Old Man or his direct representatives. I did all four in my first two years in the company and for a while lived to tell the tale. What got to me in the and was (c), I kissed the whip very poorly indeed.

Hamilton, Eckert and Seeber settled the specs in just a few days. There had been a series of memos and meetings in 1945, and not just desultory ones. John McPherson, then director of engineering and approximately Eckert's boss, had made heavy contributions — intellectual and technical, not managerial, ones. The old-timers who had built the Harvard machine and held the primitive but valuable vacuum-tube-circuit patents had joined in. What was lacking was money, people and priorities. Watson supplied them.

The SSEC was built in Endicott, under the toughest kind of forced draft, out of standard pieces and simple curcuitry. Only IBM could have done it. No other outfit had stuff on the shelf — well, except the phone company, and it was too hidebound, had no Watson and wanted none. By today's standards, the cost was low — not much more than a million dollars. But T. J. brooked no

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nonsense from bean counters. There was a story in the trade that when Claude Shannon and his wife were moonlighting at the Murray Hill Bell Labs and "borrowing" components from the stockroom to build a maze mouse, accountants disguised as janitors were recording every peculation and taking notes for the patent attorneys besides.

None of that in 1946 to 1947 IBM. The million dollars or so were off the top; the myriad services that Hamilton drew on from the rest of the company, ranging from the time of Eckert and McPherson down to that of the Endicott janitors, were never charged. No one knows — in fact, no one ever wasted time trying to find out — what share of IBM's total resources over, say, 18 months went into the SSEC. I'd bet it was 4% or 5% at a time when total annual sales worldwide were well under $200 million. Ah, Watson!

I said McPherson was approximately Wallace's boss. There were no organization charts in IBM, and if there were any in 1958 when I was invited back to the much larger company — T. J. died in 1956 —, I never saw them. Tasks in the '40s came almost entirely from Mr. Watson.

If John had needed to force something on Wallace — and he almost certainly never did, at least for many years — he would have had to somehow arrange that his needs reached T. J. The latter, if he agreed, would have given Eckert the word, and in no uncertain terms. The idea of formal, announced channels of authority, so prevalent in General Electric Co. in the '50s, when I worked there, was unheard of in IBM. Mr. Watson ran everything.

By extension, there was no budget. Oh, there were accountants. There were taxes due in many countries, an annual report to produce, invoices to send, bills to pay and some very strange Watson charities and benefitences, we understood. But in general, people downstairs proposed and Mr. Watson disposed. You — well, not me, but Eckert for instance — sat outside The Old Man's office until someone shoehorned you in between the man from the Metropolitan (Opera or Museum, he did both) and the regional manager he was "promoting" to run the Anchorage, Alaska office.

You asked briskly for what you needed, answered amazingly pointed questions and got your money or your refusal or something in between. Very quickly.

I have often said Watson kept the money in a shoe box and handed it out to petitioners as he saw fit. That's amusing and somewhat true, but it doesn't allow for certain things, particularly that the box never ran empty; he had a magnificent feel for the inflows as well as a running score on recent disbursements. Also, there were secret forces at work.

He could expand Poughkeepsie off the cuff, but something more sophisticated must have been coming over the wires from World Trade in Europe. And he had more than sources of information; he had hidden controls. Watson could speed up or slow down the factories and deliveries and, hence, rental income — there was always an eager waiting line of customers, especially at war's end. All it took was a short call or note to George Richter, the Gray Eminence of Scheduling, two floors away.

Even in the '40s, IBM was something special. It was small compared with, say, GE, it was already recognized for its amazing growth, its cash flows (for years to come, the punched-card machines and the early computers would only be rented), its lovely profits and, above all, its Maximum Leader. Watson was into everything; not just the opera and the art world, but as the most powerful trustee of Columbia, the head of the International Chamber of Commerce and in a hundred power-related civic tasks and charities. A whole floor of World Headquarters at "590" [590 Madison Avenue] could barely hold the secretaries and assistants that surrounded this power source.

Where an AT&T or an RCA would have had to go through carefully announced organizational maneuvers and much-discussed budget reallocations to start up a Hamilton group, T. J. did it in minutes.

And with the Endicott and World Headquarters grapevines carrying the word about Watson's heavy support, Hamilton in turn could cut through personnel and procurement problems almost instantly.

And these problems were

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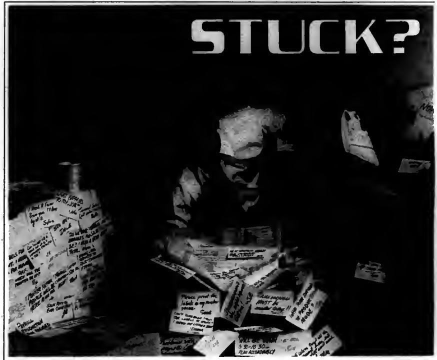

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■ CONTINUED FROM PAGE 47

serious; remember, this was 1946, and even IBM was having trouble with people and supplies. Frank's engineers had expediters up and down Cortland Street looking for surplus electronic gear, and the major factor in choosing vacuum tube types for the buffer memory and arithmetic unit of the SSEC was availability.

In parallel with the electronic and mechanical work — system design, we call it now — the physical layout and handsome presentation of the huge machine had to go ahead. As soon as the French Bootery was known to be extrudable, plans for a big power supply and a unique air-conditioning system were set in motion — each unprecedented in central Manhattan and in IBM experience. No replays would be possible.

The machine took form in Endicott. A year, in spite of the Watsonian directive, was not enough. But in that year, all of the electronics, the 16-foot-high racks of special Lake relays and the incredible tape units were designed and built and tested.

On 57th Street, the heavy machinery went in. Also, there was to be a raised floor — another world first. Watson would not have his guests, his customers and his stockholders tripping over snarls of cable. The inscription on the wall had to be written, by Wallace Eckert I think, and approved by The Old Man and engraved and approved again. But that, as we all know today, is only half the story. How about the software?

No problem about languages; there weren't any yet. Whatever problem we chose would be written and debugged and run in machine language and absolute — two four-address instructions per line of input tape. Eckert and I talked it over in one very short meeting. It would be from astronomy.

The output would have actual immediate value to the national almanac offices around the world. Thus, the SSEC would calculate the positions of the moon.

Eckert had insisted from the beginning on a strong table-lookup capability — a design offshoot of the big tape drives, as it turned out. Its capabilities were set. For the demonstration problem, each date put in would require looking up sines and cosines to eight-figure accuracy. I had begun to develop a powerful method for minimizing the size of such tables.

The method wasn't quite ready, but no matter; off I went to design the table anyhow. Like everything else, it had to be ready on time — or else. Youngsters in corners at World Headquarters were feverishly writing code without knowing the first thing about lunar theory. That, too, had to be finished and checked out by opening day. Eckert was the authority. Somehow it got put together.

It is worth noting that the check calculation, done on a Friden desk calculator by Eckert's assistant Becky Jones, took more than three months for one date! And even then, we did not have time to duplicate the table lookup and arithmetic operations to the full precision of the machine, which was 14 decimal digits. Other tests of the pertinent units and my off-line experiments on the sine/cosine table had to suffice.

Incidentally, among the youngsters were John Backus, the father of Fortran, and Edgar Codd, the father of relational data bases.

The programs and data and my table material were punched at the Watson Lab on standard IBM cards. These were converted to input tapes on a freestanding punch called the Prancing Stallion (for its profile), which was later put in its final position on the SSEC raised floor. Some program testing was done under Rex Seeber while the machine was partly assembled in Endicott, but most of it had to be deferred until just before the ceremony.

About those tapes: The card plant in Endicott got enormous rolls of card stock from the paper mills. For regular card manufacturing, they slit the rolls to 3-inch width (card height). For the SSEC they furnished rolls eight inches wide (card length). The resulting rolls weighed 400 pounds and had to be hoisted onto the SSEC with a thoughtfully provided chain fall. For the Stallion, we pushed the rolls up a ramp.

The punch stations, slightly modified from standard IBM reproducer components, punched two round sprocket holes at the edges and 78 regular IBM rectangular holes in between. The sprockets drove the tape one line at a time, and drives under separate program control fed the fresh or prepunched tape under 10 78-brush reading stations. The tapes hanging down could lengthen and shorten; for program tapes and the table lookup unit, we cemented the tape end-to-end into short loops. There were three of these monsters at the end of the machine room.

Behind the scenes were racks and racks of superfast small relays, which were used for intermediate storage. The tapes were slow storage, and of course we had infinite storage on standard punched-card decks, which could be read by the SSEC directly and punched. The two printers behind the operator had hidden plugboards for producing handsome output formats.

On the famous Thursday when The Old Man ordered us to remove the offending columns, Rex and his crew had had all of these units buzzing and punching and looping. But the lunar program had not yet run. I was smugly aware that the sine/cosine table was checked out and working, so I was somewhat relaxed. But the strains were palpable.

Two months before, Hamilton had committed to an opening date: Tuesday, Jan. 27, 1948. He had done his fantastic task — designed and built the huge system, assembled and partially tested it in Endicott, torn it down and shipped it to Manhattan, fended off the unions

CIRCLE READER SERVICE NUMBER 198

who demanded that nonunion IBM let them reassemble the monster, provided the support systems and prettied up the joint — all in a little more than 16 months. And, to jump ahead a little, on opening day, everything ran! Yes, the hardware and the program and the air conditioning and the people — one of the very greatest feats of nearly a century of data crunching.

On the great day, the multitude assembled. It was not the first major Watson charivari I had attended, but it was a first for Rex and his senior crew. Everyone looked very cool and confident — T. J. himself because he assumed everything was as ordered, the rest of us because he was watching.

The scientific contingent turned out in full force: I hosted one table at lunch and landed Richard Courant, whom I greatly admired and had never met.

Like most of the seniors present, he assumed that there would never be more than two or three machines like the one being dedicated and that only very special science would ever be allowed near them. Today, the New York University center named after Courant mounts several hundred thousand times as much computing power as the SSEC and complains about the constriction!

Mr. Watson — you couldn't call him anything else at that moment — made a sententious little speech and posed for photographs with guests. One could often figure out who wrote the draft of a Watson speech; I could hear Eckert in this one, but the overall effect was preachier — probably from Swayne Orton, editor of *Think*.

Six months later, my wife Dorothy and I received a telegram delivered to our apartment in Chelsea, although addressed to the Watson Lab at Columbia University. It invited us to an IBM Family Weekend — at the Waldorf Astoria, no less — to thank the men who had worked so hard on the magnificent Selective Sequence Electronic Calculator, now at work on important scientific problems at IBM World Headquarters, and especially to thank their wives, who had been so supportive.

It turned out that the last time The Old Man had done this, he had organized a private train and taken a hive of senior executives and their wives cross-country to see the IBM exhibit at the San Francisco World's Fair.

You can imagine the scurry for babysitters and new hats in Endicott. Come the great day, Mr. and Mrs. Watson had a little luncheon for us (and a hundred or so headquarters executives and their wives) in the Wedgwood Room and told the honored, if somewhat flustered, ladies that the weekend was theirs. "Go to restaurants and theaters and the opera as IBM's guests," Watson said. "Enjoy the shops and the spectacle of New York. We at World Headquarters thank you for the support you and your families gave your husbands, which in turn enabled them to produce this spectacular machine." There were tours of the SSEC, by the way, which many of the wives had not seen — a nice touch.

The next night, the Watson Lab couples, who after all lived in the city, had a fancy dinner together in the hotel. As a matter of convenience, sitting at one end of the table, I signed the check — about $200 (it would be five times that today). Six weeks later, Eckert got a phone call from a hushed-voice little bean counter at "590." "About this, ah, rather large restaurant charge . . ." Eckert told him it was quite all right; he had been in the party. There were accountants in IBM. They just didn't come out of hiding very often.

Watson got his investments in the price of the SSEC and in the Family Weekend back manyfold. The one placed him in front in the Big Science sweepstakes at a time when a dozen larger high-tech companies should have towered over him. The other confirmed the feeling in 200 engineering and executive families that Mr. Watson'a IBM was a wonderful place to belong to. It was a good time to be an emperor.

This material is drawn from a book on the history of computing being developed by Grosch. He is known for Grosch's Law — the relationship between computer speed and cost. He has worked twice for IBM, twice for General Electric Co. and twice for the federal government, most recently as director of the Bureau of Standards Institute.

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HOW TO GET THE MOST OUT OF IBM MACHINES

ALLIED/SIGNAL

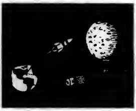
The data center at Allied/Signal Bendix Aerospace in Teterboro, N.J., serves a multitude of masters — the sector headquarters with which it shares housing and 10 autonomous divisions throughout the country. In fact, its diversified responsibilities make it "the largest data center in Bendix Aerospace operations," says MIS director Regis Bob. For the past year, the engine that powers the data center's support of data base and manufacturing applications for the 11 separate operational entities has been an IBM 3090 Model 200.

This is the third generation of IBM mainframes used at the 4-year-old center and represents a departure from sequence. "We began our existence with an IBM 3081 Model D and then moved onto a 3081 Model K," Bob says. "We could have gone on from there to a 3084, but looking at the usage patterns here and the fact that there wasn't any growth path from that machine, we decided to jump to the 3090 Model 200. The Model 200 gave us a next-step option in the Model 400."

That choice was a wise one, he adds. After one year, more than 50% of the current machine's capacity is being utilized and within a year, the need for more CPU cycles and internal memory will probably cause the center to exercise its expansion option.

In fact, Bob has already gone back to playing with his Lego building blocks, which he uses to create scale models of the data center, in anticipation of the upgrade. "People laugh when I tell them what I have on top of my desk," he says. "But the representation of the data center that I put together with Legos last time — and also working with IBM's planning personnel — really helped me to see how the 3090 was going to fit."

Actually, the replacement of the 3081 Model K with the 3090 Model 200 required very little in the way of spatial adjustments. "Except for an extra motor generator, the space used was almost the same," Bob says. The only other change within the facility, he adds, was the acquisition of a more powerful chiller. "The one we had was more than adequate for the 3081, but it couldn't give me the redundancy I felt we needed for the 3090." Actually, installation of the 3090, which took one Saturday and therefore claimed only a half-day out of the center's normal 6½-day-a-week production schedule, was a minor ripple compared with the continuing headaches of managing communications interfaces between the mainframes and an eclectic assortment of data collection hardware within the divisions that tie into it via a leased-line network.



Each of the 10 divisions the data center serves is run as an autonomous business unit, and seven of those 10 maintain their own systems staffs. The result, Bob says, is a steady stream of control and compatibility issues.

To alleviate some of the problems, Allied standardized on IDMS from Cullinet Software, Inc. in Westwood, Mass., as the data base management system of choice. Six of the seven divisions involved in manufacturing also settled on the use of some modules of Cullinet's manufacturing system, although the modules they chose to implement varied depending upon individual need and many have made their own modifications.

Still, it is in the area of data collection hardware selection that the greatest problems arise, according to Bob. "There are five different kinds of equipment in use within the divisions," he says, "and although everybody says that the communications interface is transparent, our experience says that's just not true."

ILLUSTRATIONS BY MITCHELL J. HAYES

BEECH AIRCRAFT

At Beech Aircraft Corp., a division of Raytheon Co. headquartered in Wichita, Kan., research and development projects are setting new speed records thanks to the added propulsion of vector processing.

In October 1985, Beech replaced an IBM 3084, used for a variety of applications, including engineering and manufacturing control, with an IBM 3090 Model 200. Although the arrival of the 3090 brought improved throughput for all applications, the gains in engineering and design resulting from the machine's vectorizing facilities have been particularly impressive, says Merle Schwartz, manager of scientific computing.

On its first major design and production assignment — an ambitious new fuel-efficient, nine-passenger executive aircraft called Starship — the IBM 3090 Model 200 shaved substantial time and expense from the development cycle. Although the delivery date for the new plane is not fixed, the span from initial design through Federal Aviation Administration certification is expected to be one-third to one-half the time than would have been possible using the previous equipment.

What is equally important, Schwartz says, is that with this system, "we were able to move from the first to the second prototype with only minor changes instead of the kind of major redo that is usually required."

The importance of vector processing for this kind of application, Schwartz says, is that it allows complex mathematical operations, such as those required for aerodynamic and structural analysis, to be performed with more efficiency. This efficiency comes from the fact that mathematical routines can be arrayed and pipelined with a single instruction.

"Let's say that an engineer wants to multiply 128 separate numbers," Schwartz explains. "With scalar processing like the 3084 performed, the machine must execute the multiply routine 128 times. With the vector facility, the machine processes all 128 sets of numbers with one instruction."

In design and analysis, this capability means both radically reduced time expenditures and much more "what-if" freedom. "In our airflow studies," Schwartz says, "we found thet what used to take 60 minutes on the 3084 now takes only eight minutes of the 3090 using the vector facilities. This means an engineer can run seven times as many jobs in the same period. Also, he can study one part of the plane, like the wing, more closely or he can bring in other geometries, like the fuselage and tail, and analyze the impact they have upon each other when airborne."

Before Beech settled on the IBM 3090, there was some thought given to purchasing a separate vector or array processor, Schwartz says. But the company decided it made more sense to go with an integrated system that would not only allow it to preserve unity of operating environment but also offer performance gains in a range of applications.

The IBM 3090, like the 3084 before it, supports not just engineering but manufacturing scheduling, planning and control, marketing and finance and a parts-ordering network for 50 Beech dealers in the country.

For the majority of the more than 1,100 users, it is the nonvector processing performance of the 3090 that is important. And here, too, according to Schwartz, the numbers have been impressive.

Although the 3090 Model 200 has only two processors and the 3084 had four, benchmark comparisons showed the new equipment's scalar processing performance to be two to three times faster. The most impressive results are in the design, engineering and manufacturing, which can take greatest advantage of some of the 3090's power features, like its high-speed multiplier and fast add and subtract circuits for floating-point calculations.

But even for the commercial or business applications, the improvement has been substantial. Benchmark tests on the commercial workload "clocked a two-to-one improvement in CPU time," Schwartz says. And in the real world of application throughput, gains of 10% to 15% have been reported.

W. Ben [illegible]
Executive Vice-President
Texas Commerce Bank

A banker's solution

The Problem:

We faced a five year backlog plus an estimated three year invisible backlog. Our solution came from a source we didn't expect.

Pressures to resolve the backlog problem (within budget) required special attention because of our unique cost/performance history and aggressive corporate profitability goals.

In terms of profitability, Texas Commerce Bancshares (TCBK) consistently ranked first or second in the nation, until the oil problems of 1985. During the preceding 18 years, TCBK continuously increased earnings, quarter over quarter. In 1985, expenditures of the Data Services Group totaled less than its budgets for either 1984 or 1983. Since 1983, on an aggregate basis, Data Services has been under budget by $5 million, on an approximate $32 million base. These records posed e formidable mandate to find or develop a highly cost-effective solution for the backlog problem.

Texas Commerce Bancshares, a holding company, owns 70 member banks in Texas. These comprise the Texas Commerce network. Statewide, it ranks fourth largest in asset size. Nationally it ranks twenty-fifth.

Headquarters of the Data Services Group are located in our Houston data center. We also operate major regional data centers in Austin and Dallas, plus 12 remote centers throughout the state.

We streamlined development procedures and exercised all appropriate efficiency measures. But during the same time, user sophistication in terms of the number and complexity of requirements offset our productivity gains. At this point, we recognized two alternatives: Radically increase our programming staff (which would not have completely solved the problem), or acquire a productivity tool.

Product Evaluation:

We created a product study team which outlined and prioritized our selection criteria. During this process we discovered Transform Logic Corporation — a relatively young company that developed and markets Transform,® which was claimed to automatically create and maintain complete, efficient, structured COBOL application systems directly from preliminary, non-procedural design input, without use of a special high level language.

Our original product selection criterie included the following major items:

- Online design capabilities, using graphics.
- Prototyping.
- COBOL generation in batch, IMS and/or CICS.
- Screen painter.
- Support all major access methods.
- Generate code which runs in a stand alone environment.
- Generate code that can be modified and recompiled, without having to regenerate the entire system.
- Self documenting.
- Generated systems which run as efficiently as hand coded systems.
- Automatic Generation of Help screens.
- Generated code should be structured.
- Generated code paragraph names and data names shoutd be meaningful and easily maintained by a programmer, if required.

Transform Logic invited us to participate in what it calls a "Prove-It" demonstration. The vendor asked us to bring an application which had taken approximately three months to develop by conventional programming methods. They warranted that, using Transform, the application would be generated in two days, precisely to our specifications.

We had recently completed such an application, our Business Development system. It tracks certain types of customers, their locations throughout our network, types of services we provide, key contacts, and related information. We took this system and the programmer who wrote it to Transform Logic's headquarters in Scottsdale, Arizona. Within a day and a half, we had a complete generated COBOL system. It consisted of 20,000 lines of generated code and five lines of hand written code. It had three different databases and three different transactions. One transaction used one database. Another used two databases, and the third transaction used all three databases. Transform automatically generated Help screens and field editing.

Back in Houston, the author of the application analyzed the generated code. Of course it had different data names. But in many instances, he found the generated code almost identical to what he had written. In some instances he admitted that it was better than what he had written. He further remarked that if he had more than three months, he too could have included Help screens. This analysis convinced us that, using Transform, we could meet our rather ambitious goals. But at this point, our attention shifted to other issues.

First, Transform used a new technology. That fact maximized our dependence on the vendor. We wondered how Transform Logic would stand behind its product. Would our people be able to pick up the knowledge needed to use this product? How responsive would Transform Logic be to our questions? What impact should we expect Transform to have on our people, our departmental structure, our daily routine, and our basic departmental approach to doing business? What fundamental do's and don'ts surround the transition to Transform?

We "introduced" Transform by presenting it to a steering committee, a priority setting group, which meets each month to evaluate new products and track progress on large projects. Our internal documentation included capabilities of Transform, its costs, its benefits and its pay-back. The steering committee approved the proposal. Then, because of the dollar expenditure, it went to the Strategy Committee, which also approved it. That gave me authorization to enter into e contract with Transform Logic. During the contract meeting we defined scheduling, training, installation timing and procedures, and other details.

Use & Features:

Transform Logic installed the product over a weekend, then returned for a

A Superior Way for Organizations to Solve Key Data Processing Problems.

WILSON SPORTING GOODS

At Wilson Sporting Goods Co. in River Grove, Ill., there is no question from an operational point of view that two smaller mainframes are better than one large one.

For a number of years, the company has used two IBM 4381s, one running under VM and the other under MVS and linked via Systems Network Architecture and VTAM to IBM 8100s in satellite factories and field offices.

The primary advantage of this arrangement, according to Alan Bugh, MIS vice-president, is that it allows Wilson to enjoy the efficiencies of integration while keeping the on-line and batch environments sufficiently isolated so that shutdowns for IMS processing do not affect factories that need 24-hour access to computing power.

Until recently, it seemed likely that this distributed environment was doomed to disappear like the 8100s, which had no logical successor and became strained from age and escalating demand.

Some units with 30 or more terminals attached were already exhibiting some degradation in response time, Bugh says. Given the lack of a clear upgrade path, the company reluctantly began to think in terms of consolidating on a single large system.

Then, Bugh says, came a reprieve. IBM announced its 9370 product, which, since Wilson had taken the precaution of writing its code in the slow but highly portable DMS, gave the company a clear migration path.

The only concern at this point, according to Bugh, is the relatively high cost of operating systems software in a 370 processing environment. "IBM has begun to address that problem in some areas," he says, "but it is still very expensive to provide MVS support relative to the power you might be running."

DANA CORP.

"I think that a network should really be nothing more than a tool for getting the information you need," says Dana Corp.'s Warren Smith, systems administrator in the Center of Technology.

Smith should know. At Dana, an automotive and truck parts manufacturer based in Toledo, Ohio, IBM microcomputers are the basis for three different network installations — a Fox Research, Inc. Fox 10 Net with nearly 60 nodes that is used primarily by analysts and corporate-level managers and executives; an IBM PC Net with 12 nodes used by Dana's treasury department; and a five-node Ungermann-Bass, Inc. network set up recently in an experimental mode within the company's Center of Technology.

> Where users are concerned, we really prefer to stay true Blue.
>
> — Warren Smith
> Dana Corp.

This assortment of network vendors came about not because of dissatisfaction or indecision, according to Smith, but simply because it is one of his department's mandates to investigate various technology options.

He says the Ungermann-Bass network is being investigated, at least in part, because it offers asynchronous terminal emulation capability as well as wide-area T1 networking with local and remote bridges. This could be immediately helpful, he adds, because some Dana plants have installed Digital Equipment Corp. VAX equipment for material requirements planning applications, placing themselves outside the company's 15-host IBM Systems Network Architecture (SNA) network.

Somewhat further down the line, Smith adds, there is also the possibility that DEC Microvaxes will be introduced to handle data base-intensive applications. "We are thinking about the addition of mini capability," he says, "and right

■ CONTINUED ON NEXT PAGE

can reduce your backlog.

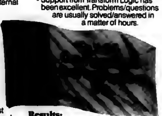
two week training session. Meanwhile, positive acceptance of Transform spread by word of mouth from those who had knowledge of it. We presented it to the staff as an upgrade for them, from analyst/programmers to analyst/designers, and much closer interaction with users. Internally, that is the product's most obvious impact. This success-oriented scenario defused any "cultural shock" or perceived "threat."

Because Transform automates programming, it forces emphasis on design. Taking the team approach, we benefit from very high quality design. To accomplish this we established a core group — those familiar with IMS and its internal details and those also well versed in Transform and its internals. Our core group trains about 10 staffers per month. When not involved with training, members of the core group serve as consultants to Transform design teams. They also assume some database administration and technical support functions to avoid potential bottlenecks in these areas.

Our use of Transform included two very aggressive pilot projects: an online inquiry system for our Trust department, and a data entry front end for our customer information system. The first system draws information from 11 databases, and consists of approximately 45 online and batch programs. The customer information system allows one entry point for setting up new accounts and for maintaining existing accounts for our Demand Deposits, Savings, Certificates of Deposit, Installment Loans, and Commercial Loans systems. This consists of 15 online programs and 18 batch programs. Each of these two pilot projects included competitive advantages and user friendly extras such as the automatic transaction reversal feature, special notes added to the Help screens, plus other refinements.

With this experience behind us, we have identified aspects of the product which we like:

- Excellent prototyping capabilities.
- Code generation in COBOL is very good. It meets all of our original expectations.
- The product supports all major access methods.
- IMS code generation is excellent
- Generated code can be modified and recompiled in a stand-alone environment.
- The generated system is very well structured and easy to follow.
- The generated system automatically provides Help screens.
- The generated procedure and data names are well structured and meaningful.
- The generated system runs as efficiently as if hand coded.
- The generated system typically has more features than a hand coded system.
- The product has its own active data dictionary.
- Support from Transform Logic has been excellent. Problems/questions are usually solved/answered in a matter of hours.



Results:

Our product evaluation continues by carefully measuring our performance with Transform. As we progressed through the first few system developments, we **experienced productivity gains from 2.5:1 to 10:1.** We estimated 3,800 hours to complete the customer information system by hand. Actual hours using Transform totaled 1,850 for an approximate savings of $100,000 of staff time plus a quicker installation. However, we expect improvement in this area as we become more familiar with Transform. During the next 12 months, we plan to complete four major projects using Transform: A cash disbursement subsystem for Trust, data entry and validation front end system for Trust, commitment accounting subsystem for Commercial Loans, and adversely graded and charged-off loans subsystem for Commercial Loans. We **have estimated our savings through the use of Transform on these projects will exceed $500,000.**

Helpful Hints:

If you contemplate using this product, I can reaffirm some aspects and recommend others. First, the product performs substantially as advertised. No big surprises. Second, vendor support (on site and telephone) is excellent. Third, Plan ahead. Plan for a core group to learn everything it can about the product. The group should be comprised of experienced people who know IMS or CICS database design principles, and who know your standards for developing systems and moving the systems into production. Plan to let them teach others. Programmers with one or two years of experience have no trouble learning the concepts of developing systems with Transform. Plan on making adjustments in your database administration and technical support areas. We now have the capability of generating systems so rapidly that sometimes the user can't verify that they are correct in a timely manner. We can create a backlog on the users' side. So a balance of organizational functions becomes important.

Procedurally, I recommend small non-critical development efforts for your first two or three projects. These should access no more then three databases, and should include no more than 10 programs. This practice will allow time to develop internal procedures. It builds morale and confidence. And it reduces the learning curve. Set a limit of five to seven people who work on the initial projects, and select these people with the intent that they will comprise the core group that I mentioned.

These measures should place your organization in an optimum position to take advantage of Transform's capabilities, in the least amount of time.

One Final Point:

One final point. To date, our use of Transform has focused on development of application systems. However, system maintenance typically consumes a larger budget than development. Since Transform also automates ongoing maintenance, we have no doubt about achieving our goals.

Product Data:

To learn more about this expert system approach to automation in IMS and CICS environments, contact David Orchard, Product Information Dept., Transform Logic Corporation, 8502 E. Via de Ventura, Scottsdale, AZ 85258 or call (602) 948-2600.

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CIRCLE READER SERVICE NUMBER 195

■ CONTINUED FROM PAGE 53

now the Microvax looks like the most likely possibility. The smallest IBM mini would be in the System/34 to 36 range, and with that, we'd have to be concerned about upward compatibility."

At the microcomputer level, however, adherence to the IBM standard is strictly enforced. IBM Personal Computer ATs are employed as file servers and workstations in areas in which a local hard disk is necessary; the balance of the machines are composed almost entirely of IBM PCs and PC ATs.

The only exceptions are 10 IBM compatibles of various types, deployed as gateway servers, and seven Compaq Computer Corp. portables that are utilized by the internal audit department. "Where users are concerned," Smith says, "we really prefer to stay true Blue, because we pretty much know how those machines are going to work under various conditions, including different kinds of software."

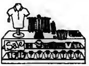
Minimizing surprises is important, he says, because a significant number of the network users at Dana are relatively unskilled. The goal of networking is to give the users the tools they need without putting them through unnecessary learning pains.

That same reasoning has governed the handling of micro-to-mainframe file transfers. PC network, SNA gateway capability is largely reserved for terminal emulation with file transfers accomplished almost entirely through the use of Digital Communications Associates, Inc. Irmaboards and Tempus Link. "We have just started to make some limited use of IBM's File Transfer package," Smith says. "But for the most part, I think we'll continue to use Irmaboards and Tempus Link. It is slower but a little more user-friendly."

J. C. PENNEY

The IBM Series/1 may never have been a great applications box, says Bill Friel, vice-president/director of systems and data processing at J. C. Penney Co. in New York, but even with its old 16-bit architecture, "It is still one of the best gateway and concentrator-type boxes on the market today."

That is really the only qualification that counts, as far as Penney is concerned. What the Series/1s were brought in to do, Friel says, was support communications between major store locations and a corporate IBM SNA data network. This network spans seven data centers and links approximately 50 IBM mainframes ranging from 3081s to 4381s. Friel and staff realized four years ago that if they were to provide the business support required, an integrated data network that would reach down into the stores was needed.



Having reached that conclusion, Penney started to equip its store locations with Series/1 minis for communications processing and gateway access to the host network.

In a typical store-based installation, the Series/1 handles a variety of communications from various sources. To begin with, each store location is equipped with a point-of-sale (POS) system consisting of a minicomputer (usually either an NCR Corp. 725 or an NCR 9020) connecting to anywhere from 40 to 80 terminals.

This POS system alone interacts with the Series/1 in several ways. Sales transactions at POS stations that require credit authorization are passed from the system mini to the Series/1, which channels the information through the data network to a front-end processor at a host data center.

From there, the transaction is switched to one of three online Tandem Computer, Inc. TPX configurations that Penney uses to handle all its credit authorizations. Responses to the waiting sales clerk and customer flow back in exactly the reverse order.

At the end of each business day, the POS mini, which has collected and processed all of the sales transactions, again uses the Series/1 to transmit that data to a central location. The data is fed into credit billing systems, perpetual inventory management systems maintained by all stores on data center mainframes, corporate accounting systems and centralized merchandising and marketing applications.

■ CONTINUED ON PAGE 56

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■ CONTINUED FROM PAGE 54

Utilizing the Series/1 are between eight and 12 IBM 3274 terminals within the store and a fluctuating number of 3274s at retail locations of customers of J. C. Penney System Services (a separate transaction processing business).

The 3274 terminals in the stores access the Series/1 for electronic mail, ordering and inquiries into the centralized inventory data base. For customers of System Services, the Series/1 serves as a concentrator for terminal connections at multiple locations for customers requiring on-line credit authorization processing.

Message traffic through the Series/1 also travels in reverse, as centrally produced reports on inventory and merchandise performance are fed from the mainframes into the network for remote printing at store locations.

Penney's information system strategy did not fall into place rapidly, Friel says. In order to accomplish the kind of data exchange required, the company wrote many of its own message interface programs and worked closely with IBM on a number of enhancements to the Series/1 and the RPS operating system.

Among the challenges along the way, he says, were the expansion of addressable space and the development of software thet would allow full remote management of the Series/1, including hardware and applications diagnostics.

"The Remote Management software was absolutely key to this process," Friel says. "We had to have a system setup thet would not require store personnel to manage or maintain it."

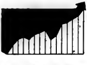
The company also uses its 650 Series/1s to store time and attendance data collected from magnetic tape-strip badge readers and to handle some automated scheduling based on that information.

DREXEL BURNHAM

With an IBM 3090 Model 400 in place, Drexel Burnham Lambert, Inc. no longer has to worry about market peaks, at least in the sense of transaction processing.

When the 10 a.m. opening and 4 p.m. closing bells ring on the trading floors of U.S. stock exchanges, William Tuite, senior vice-president in charge of the Informaton Systems Division at the New York-based capital market investment banking firm, now feels sure there will be no flutters in response time for the firm's hundreds of worldwide traders who are supported by its on-line trading system.

Until last November, Drexel Burnham Lambert ran its huge Firm Trading System (FTS), a collection of hundreds of program modules for on-line data base management and decision support in all the financial instruments it trades, on an IBM 3084. Moving up to the 3090 line was no trivial task, Tuite says. "We had to go to the MVS/XA operating system, which meant bringing all our IBM operating software up to the specified levels and then doing a sysgen." The effort involved was justified, though, he says, by the improved consistency of response time at those peak-load hours.



"The 3090 is built differently," he explains. "It uses cache memory instead of paging to the hard disk, which means that you have an electronic operation instead of an electromechanical one." Translated into operating results, the change has meant achievement of an average response time of under half a second without any discernable degradation at peak demand.

Growth of the on-line trading system has been so rapid, however, that the requirements of that usage — combined with those of hosting a worldwide high-speed administrative data network — made Drexel Burnham's first IBM 3090, a Model 200, a candidate for an upgrade before its first year of service was completed. With one Model 400 now in place, the firm will be installing a second next month to spread out the applications and help to carry the load of an extension of FTS to 24-hour service.

The original IBM 3084 was not retired, merely transferred to slightly less taxing duties. It now serves as host for the firm's information center, as well as a major portion of the programming support activities of the 400- to 500-member programming staff.

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CIRCLE READER SERVICE NUMBER 196

INTERNATIONAL

IBM enters price cut war with Japanese counterparts

BY TAKEHISA KONDOH
CWCINS/Asian bureau

TOKYO — IBM seems intent on imitating one successful tactic of its Japanese counterparts: Offering deep price cuts and flexible pricing in hopes of gaining lost ground from Fujitsu Ltd., NEC Corp. and Hitachi Ltd. in an increasingly competitive Japanese market.

The traditional image of IBM as a company denying discounts is fast eroding in Japan, especially in the mainframe arena.

"When we talk about pricing, IBM has become very realistic and responsive to users," says one sales executive with a major Japanese vendor. "That style has been our patent."

One example of IBM's emerging sales strategy was provided last spring when IBM Japan Ltd. beat Fujitsu, NEC and Hitachi — Japan's big three — in a race to deliver a 3081-class mainframe to state-run Tohoku University.

Insiders speculated that to clinch the deal, IBM Japan offered the university a whopping 80% discount, compared with an average discount of 30% offered by the three Japanese vendors.

IBM's attractive pricing policy in the Japanese market, which has evolved in recent years, is particularly evident in the government and academic sectors. These factions, which together account for 20% of Japan's total market for mainframes and peripherals, have long been dominated by domestic manufacturers.

Industry sources maintain that IBM has taken a lesson from its Japanese rivals, which have been nibbling away at IBM's market share in Japan's mainframe arena. According to an official at one plug-compatible vendor, IBM's new pricing tactics "surfaced in 1983, took root in 1984 and prevailed last year."

Until 1983, any price-related announcement by IBM in the U.S. was reflected closely and immediately in Japan.

Computer analyst Yoshinobu Watari says, "IBM Japan seems to have gained much independence in determining pricing for Jspanese users."

Moreover, IBM Japan, a wholly owned subsidiary, has elected not to announce price cuts, s strategy speculated to allow Big Blue to provide big discount margins.

Japanese plug-compatible vendors, such as Fujitsu and Hitachi, are expressing jitters over so-called "shadow prices" thet have been set by IBM Japan.

Another aspect of IBM Japan's price offensive is the stretching of its volume-discount program in hopes of attracting more customers from Japan's big three.

IBM Japan would not officially admit a shift to a more lenient pricing system, citing its Business Conduct Guideline, a code of conduct preventing employees from offering independent discount sales. "There's not a single change to our sales policy," one official says.

Analyst Watari contends, "The driving force for the ongoing change is IBM's simple desire to reclaim its leader's position in Japan."

In 1979, IBM Japan slipped to the No. 2 slot behind Fujitsu in overall domestic sales; it then fell to third place behind NEC in 1984.

IBM Japan's aggressive style appears to be the backbone of a long-term management plan issued recently in Japan.

According to President Takeo Shiina, the company projects an annual growth rate of 20% or more in domestic sales, reaching $13 billion by 1990. The vendor's 1985 sales were $4.3 billion.

IBM envisions a bright future for Japan, a market poised to claim a healthy share in the Big Crescent, an area covering Japan, South Korea, China, Taiwan, Hong Kong, the Philippines, Singapore, Indonesia and Australia.

The Pacific Rim region accounts for s modest 14% of IBM's revenue worldwide, but the area's predicted annual growth rate of 20% or better is greater than that of the U.S. or Europe.

> The traditional image of IBM as a company denying discounts is fast eroding in Japan, especially in the mainframe arena.

"It's logical for IBM to focus its attention on the Japanese market," from which it gains about 70% of its Asian and Pacific revenues, Watari says.

Reports show that IBM's new approach to pricing in Japan has generated positive preliminary results. IBM Japan recently revised upward its 1986 sales estimates for the 3090 Sierra series by 30%, to about 210.

To handle mid-range systems and personal computers, IBM has set up an extensive network of 116 exclusive dealers.

In addition, to catch up with Fujitsu and NEC in sales of minis and microcomputers, IBM Japan has started subsidizing its dealers' trade shows and advertising campaigns.

IBM plans to quintuple its number of dealers and other sales agents over the next five years.

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CIRCLE READER SERVICE NUMBER 161

European Community casts watchful eye on pricing

By AMIEL KORNEL
CWCINS/European bureau

PARIS — The wary eye of the European Community (EC), segmented markets and roller coaster currency fluctuations complicate and restrain IBM's pricing practices in Europe. Scrutinized closely for possible antitrust violations by the Brussels-based EC Commission, IBM is conservative in its discounting practices in Europe.

"IBM could bankrupt any one of the national champions by dramatically cutting prices in one area," says a strategist at s French computer vendor. "But they would be in great trouble with the EC," he adds.

According to Jean Segonds, vice-president of corporate marketing at France's largest computer lessor, ECS SA, IBM discounting practices are less aggressive in Europe than in the U.S. and Japan owing to a certain fear of being attacked in the European Court of Justice for abusing its dominant market position.

"In Europe," he says, "IBM can't take the risk of being more aggressive in discounting."

Discounts offered on big systems generally run from about 10% to 15%, according to sources, compared with the 20%- to 40%-cut rates that are common in Japan.

In one case, according to Segonds, a French company thet last summer ordered 3090/200 and 3090/400 systems was offered an 8% discount for an order of five to 10 machines and a 17% reduction for more than 10 machines.

Nonetheless, Big Blue seems to be adopting new sales tactics that could have the effect of increasing price pressure on European competitors.

"The tendency is growing rapidly toward greater discounting," according to Segonds.

"IBM provided a price umbrella to competitors in the past," says Pieter Kruth, marketing manager at Siemens AG's data processing group in

■ CONTINUED ON PAGE 58

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■ CONTINUED FROM PAGE 57

Munich, West Germany. "But we can see that they have changed price/performance to have lower prices."

"IBM tightened the price umbrella at the beginning of this year," asserts one European industry source. But, he adds, "It must carefully balance that against the risk to competitors. Those companies will fold and go right to the European Court of Justice."

While walking this financial tightrope, the U.S. giant nonetheless seems to be stepping up volume discounting as it seeks to bring in more European business. "It always existed," one official says. "But in smaller European companies and administrations for the past two years IBM has been using special bids to get greater market share."

Siemens' Kruth says, "They offer real substantial discounts for everything."

The recent reorganization of IBM Europe, whether by design or by accident, could facilitate the firm's adoption of a more flexible pricing approach.

According to Segonds, government bodies receive a 7% discount in addition to any other discounts.

IBM last year started allowing clients to mix different products together in determining a volume discount level. "The announcement was in response to industry trends and practices," a spokeswoman at IBM Europe explains. "Customers can choose products for purposes of volume discounts more in line with their specific business needs."

In addition, the recent reorganization of IBM Europe, whether by design or by accident, could facilitate the firm's adoption of a more flexible pricing approach. While list price policies are unlikely to change, discounting could become more aggressive in coming months, according to European industry officials and analysts.

IBM Europe reorganized its sales operations as of Sept. 1, giving greater responsibility to national organizations. With greater autonomy, the local subsidiaries are freer to focus on vertical markets. Commenting on the decision, an IBM representative says the objective was "to make the country units as self-sufficient as possible."

IBM denies, however, that the reorganization means prices will vary from country to country. "Our objective is to have similar price levels for the same product offering across Europe," the IBM Europe representative says. "To achieve this it is necessary to coordinate pricing for most IBM products at the European level."

Competitors are skeptical. The reorganization "will certainly give more variability in pricing," the analyst at the French vendor predicts. With greater profit-and-loss responsibility at the national level, sales agents will have more discretion in determining the discounts offered to big clients, he explains.

According to Paine Webber, Inc., IBM increased prices in the UK and Norway on Oct. 3 — System 3090 Model 150 and 180 prices were raised 6%, and 3090 Model 200 and 400 prices were raised 3%. At the same time, IBM cut 3090 system prices in Switzerland by 7% and 9%, respectively, and dropped prices in Austria, Belgium and the Netherlands by 3% and 6%, for the respective models.

The recent reorganization of IBM Europe, whether by design or by accident, could facilitate the firm's adoption of a more flexible pricing approach.

"With greater decentralization," says an official in charge of pricing policy at a major European vendor, "you are freer to have a divergence of prices."

The process may have started before the reorganization. For about the last year, Kruth says, IBM has been offering more freedom to national subsidiaries in setting prices. List prices across Europe already vary when compared at current exchange rates. While they generally stay within a few percentage points, the different market demands in each country and currency fluctuations trouble IBM's efforts to keep prices in line across borders.

Like other international vendors, Big Blue attempts to forecast currency fluctuations when it sets prices. "When you price, you don't price for today," explains Federico di Trapani, vice-president for corporate marketing at Italy's Ing. C. Olivetti & Co. "You price for a given period of time."

But the world's serpentine monetary system can prove unpredictable. In the UK recently, IBM announced it was increasing mainframe prices by 6% because of a deluge of orders from non-UK European clients trying to take advantage of cross-border price skews created by the weakened British pound.

Even currency fluctuations aside, differing market conditions in each country mean that prices cannot be set at identical levels even at product launch.

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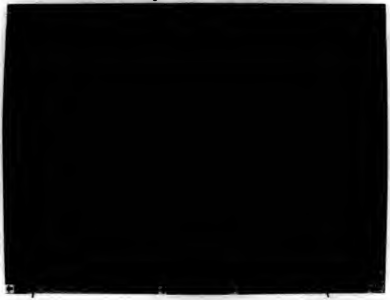

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CIRCLE READER SERVICE NUMBER 169

INTERVIEW

Edward Lucente

Resources going to marketing, engineering

Edward Lucente is IBM vice-president and group executive for the Information Systems Group. He was interviewed by Computerworld *senior writer Michael Sullivan-Trainor on IBM's corporate marketing strategy.*

Many people view IBM as a hardware company. What percentage of resources does IBM devote to hardware vs. software, and is that mix likely to change in the future?

LUCENTE: The exact mix varies product by product. But software is a very, very large part of our development resource. I would be surprised if it is not at least half of our effort.

We have software organizations dedicated not only to support and enhance the operating systems, but we also have language development activities in several laboratories. We have application-enabling development activities in three laboratories just in this country alone.

Our new effort, announced in October, is a program to package software in what we call Solutionpacs, providing customers with integrated application and application-enabling software along with the necessary support services to install them.

Applications and the software associated with applications will continue to receive more emphasis at IBM.

With the increasing importance of voice and data communications in the computer industry, is IBM planning to become more involved in the telephone business?

LUCENTE: We are offering customers a wide range of networking capabilities, and obviously our customers are placing increasing emphasis on connectivity. We are providing products to give them access to various communications systems, both on a local basis as well as on an interenterprise basis.

When it comes to pure communications, our position has always been one of allowing our customers to choose what communications company they're using for transmission. We'll work with our customers, and we'll work with any communications company, including AT&T, to help provide the customer with an integrated solution.

From that standpoint, I don't think you should imply that there's any strategy to become a provider of pure communications to our customers. To the degree that our customers are integrating voice and data in switched networks, obviously, and with our association with Rolm Corp., we are very interested in providing customers with that computerized branch exchange capability as well.

IBM's price policies and discounts seem to be more flexible than they have been in the past. Has there been a change in price policy, and if so, why?

LUCENTE: The reason for [the change] is to be more competitive and to be more responsive to what our customers are looking for. Obviously, as we have introduced new channels of distribution, we have had to change the way in which we price products because in many of those situations we are wholesalers, so to speak.

Also, there is an opportunity for discounts in our large accounts. If our customers are willing to commit to larger volumes, we are giving them discounts under our volume procurement agreement. That's nothing new. Perhaps we're doing it on more products than before, but that is something that we have been doing for seven or eight years.

The introduction of graduated charges for software in October, where the price we charge a customer for a product is based on the processing capability of the system on which it's used, is a new policy. That's a brand-new level of flexibility. The reason for that is, as we see a proliferation of small systems, departmental systems and distributed systems, obviously the market for software expands. We believe as that market expands, we have to adjust our pricing practices accordingly.

ILLUSTRATION BY KEVIN CONKLIN

We have introduced four categories of prices on close to 90 to 100 major software products, and the price of those products is a function of which category of processor that product is being licensed to. That's the first time we have introduced any form of pricing flexibility on software.

Has IBM's decline in profits caused a redistribution of resources, such as providing less systems engineering support?

LUCENTE: Yes, it has definitely caused a redistribution of resources. The assertion that we have reduced the amount of systems engineering coverage in order to accommodate it is absolutely wrong. In fact, we've increased systems engineering resources. The last place you would reduce resources during a time in which you are trying to grow an industry that is being dampened by the economic climate is in marketing and systems engineering.

In September, we announced the transfer of 1,000 people from our service organization into our systems engineering organization. In addition, since the beginning of 1986 and throughout 1987, we are increasing the size of our branch offices from approximately 23,000 to close to 28,000.

If anything, our customers should see a 20% increase in tha amount of support in marketing, engineering and administration from January 1986 to December 1987.

We have redistributed a lot of resources out of our manufacturing and development locations in overhead positions into marketing to help build that organization. All of these steps are aimed at becoming more efficient. We also announced a retirement incentive program aimed at improving our overall efficiency and helping us to deal with some surplus situations that we have.

To broaden its market areas, does IBM plan to become more of a force in the systems integration market?

LUCENTE: We have had a fairly successful business for quite a while in our federal systems division, which has been strictly systems integration aimed at our federal marketplace. Over the last two years, we have grown the division and given them the responsibility to respond to opportunities in the commercial sector. They have a fairly sizable portion of their resources today working on fairly large systems integration contracts in very large customers, such as Hospital Corporation of America and United Airlines.

Clearly, as our customers want to see applications implemented more quickly, where they don't want to invest in their own staffs to develop these application solutions, they're looking to us as well as others to provide more systems integration support, and we plan to respond to it.

How is IBM responding to inroads made in its market share by vendors, such as Digital Equipment Corp., who have a single architecture?

LUCENTE: That's a lot of stuff that people write about, but it's not that apparent to my customers. When I look at any of our large customers, almost all of them have a 370 architecture as a mainframe. Almost all of them have a personal computer architecture, and it's probably patterned after the IBM Personal Computer. So that's two architectures.

In between the PC and the mainframe is where DEC and 200 other manufacturers compete with the IBM company. They offer different architectures, and we happen to offer some alternatives. Anybody who thinks that any large customer has a single architecture hasn't called on a large customer. Every one of my large customers has at least three architectures and probably more.

Our strategy, and it's been our strategy for a long time, is to provide two architectures in the mid-range, a 370 architecture and a 3X architecture, which is either a System/36 or 38. Over time, the 370 price/performance has continued to come down, and the 3X price/performance and its performance range has gone up, and so today we have about an 80% overlap in the mid-range between the 370 architecture and the 3X architecture. And we provide the customer with a choice.

What our customers want is connectivity. I don't think our customers care about architecture as long as it doesn't force them to maintain multiple images, multiple development systems, multiple test systems and multiple programming staffs. As long as the applications that are developed are easily portable across those architectures, they don't really care.

What is cross-systems consistency, and what should users expect from it in the future?

LUCENTE: We are defining a set of interfaces between the operating systems that span different hardware, interfaces between those operating systems and the languages, interfaces between those languages and the application enablers, interfaces between the applications enablers and the applications and then interfaces between the applications and the end users.

The importance of this is that as long as our development people, our customers and independent software vendors program to those interfaces, then anything that changes within those interfaces doesn't affect the programs they've already written.

For example, if I write an application for a 370 and I write it under VM, my objective would be to be able to run that application under VSE on a 370, under MVS on a 370, or to run it on a 3X or to even run it on a PC. I want to be able to run that application in any one of those five environments. Likewise, if I happen to be a developer and I develop a data base language and I honor the interfaces between the control program and the application enablers, then I ought to be able to run my data base product in any of those five operating environments.

Our goal is to publish all of those interfaces and to continue to refine them and have them consistent all the way through. We want to make sure that when an end user moves from a personal computer to another kind of workstation display, the way in which the application shows through does not change.

That's a huge undertaking, and it's not something you announce one day that you have it all. We're talking about hundreds of IBM products and thousands of industry products and millions of customer application programs. We have been working with our large customers to identify what the requirements are.

We refer to this as our Systems Application Architecture. It will roll out in stages, and you can begin to see some elements of it very shortly.

INTERVIEW

Larry Ford

Packaging software to overcome confusion

Larry Ford is IBM Assistant Group Executive for Marketing and Support in the Information Systems Group. He was interviewed by Computerworld senior writer Michael Sullivan-Trainor about IBM's software strategies.

There have been complaints from users that IBM software offerings are too complex and too costly to maintain. What is IBM doing to address these complaints?

FORD: The best example of that is the recent announcement of what we call Solutionpacs. When we announced the 9370, we also introduced eight different packages, four of them were industry-specific packages for things like banking and retail, and the other four were more generic usability and performance kinds of things.

These are offerings that try to deal with this very point, which is how to make things not only simpler to use, but also to get the skills to the customer at the time of installation, so that when they use a product they get the right training and right support from IBM. We're really getting into an integration role here, providing education that's integrated to the specific software.

The software itself has been integrated so that there'll be multiple integrations within it, things like the application, the control program, and the telecommunications program.

Instead of the customer seeing five or six different software pieces that he has to integrate, we're integrating those as a part of the package and then providing the training and guidance on things like performance and usage.

For example, we'll bring our manufacturing people from our own plants to the customer, and the IBM people who have actually used the package in the plants will go and help the customer apply it to his particular installation.

That's an integration that we haven't had in the past in the breadth that we now see is required.

Will there be other releases of this sort in the near future?

FORD: We see it as a general industry requirement and so what we're trying to do is pick the areas of highest leverage, and those areas are where there's a common customer requirement, where we see the need for education, special skills, the packaging of multiple pieces of software and the need to deliver that through a Solutionpac organization.

In our recent reorganization, we've put in place an executive with the resources to package all of this and to get a complete support activity delivered.

ILLUSTRATION BY KEVIN CONKLIN

VM is seen by some users as a system for interactive processing more so than MVS, which is seen as a batch-type system, yet IBM seems to be placing more emphasis on MVS, even though interactive processing is more popular. What is the distinction between these systems, and does IBM sell one stronger than the other?

FORD: VM has two roles, one is an interactive role where you have a lot of and users, and their principal application is problem solving driven off of their own specific knowledge and professional requirement, interacting with a high-performance system.

The other application is to have a common system that you use when you're converting from one environment to another or when you're trying to run an interactive system with a batch system and you want to have shared use of all of the resources. So VM has two positions, one is interactive where the professional drives the application, the other is as a consistent operating environment for migration or coexistence of multiple system kinds of images.

MVS is an interactive system as well, not a batch system. It is designed to have a high availability and a high performance for large data bases, whether relational or structured, and large application codes, like computer integrated manufacturing, insurance claims and so on, with thousands of terminals — where the terminal user isn't doing problem solving as much as interacting with the data base.

In many cases we have customers that use both, because they have VM systems that are problem solving and MVS systems that are for their large applications. In some cases we'll have both VM and MVS users running under a VM host. We feel they're two completely different systems and both are needed.

How does IBM plan to expand its software revenue as a percentage of its total revenue — through applications packages, additional or improved operating systems or both?

FORD: All of the above. If you take our customer base today, whether they're running on System/36s, 370s or 3090s, they all have requirements in two basic categories. One is to improve the responsiveness to the terminal user. People need subsecond response time. As you put more and more compute power into the customer base, there's a requirement to manage the power efficiently. We're doing a major amount of software activity to do that in everything from MVS to VM to network management to software that allows interconnection from one workstation through a host to another workstation or from workstation to workstation.

The second area is to improve the productivity of programmers and the interactive professional. This requires new kinds of software, generically described as application-enabling software that makes it easier for programmers to do their work.

An example would be expert systems or artificial intelligence, providing the ability to manage images. It's difficult for programmers to take noncoded information, such as image applications and coded information and manipulate it in an integrated way with a common language, common systems and common data bases.

So we have started work with universities around the country in areas like expert systems. We just opened an image competency center in Boston to look at how we can integrate image and data. We've developed a lot of new products that are things like DB2 that allow you to have relational data bases or things like CSP, a cross-systems, fourth-generation language that allows you to develop an application without ever writing a Cobol program.

Another area is software development with third parties. We will work to obtain a common development direction so that third parties can see where they can prioritize their software development. What we've done with the PC is a good example. We want to take that concept right up through the 3X, the 9370 and the whole 370 line and convince software houses that developing their software on our products is a good thing for them to do.

Will IBM be developing its own applications as well?

FORD: We've consolidated in one organization all of our software development and software marketing. This organization will decide what we develop based on what our skills are and where we'll work with third parties. It's a question of what's the right skill, what's the priority and what resources you have to apply.

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CIRCLE READER SERVICE NUMBER 201

SQL speaks to data bases

By MICHAEL KAISER

The real significance of DB2 isn't su much the IBM data base management system (DBMS) or even the delivery to end-users of yet another query language. What is exciting is the serious prospect of SQL as a standard for retrieving and manipulating information from data bases.

SQL could be the most important standard since Cobol. While there are minor differences among hardware vendors, Cobol has allowed well-written applications software packages to be transportable, even from mainframes to personal computers.

Hardware vendors and data base vendors, however, have unnecessarily complicated the portability issue by proliferating vastly different interfaces to teleprocessing monitors and DBMSs. A "standard" SQL interface offers the prospect of consistent data base access, though the teleprocessing monitor issue still remains.

Standardization aside, there are two other potentially beneficial consequences of the SQL phenomenon: the ability to distribute data bases and the integration of mainframe and personal computer processing.

A major implication of the coming standardization around SQL will be the opportunity to build "distributed" applications. Every major relational DBMS vendor, including IBM, is working feverishly on networked versions of SQL. Soon, users will be able to run applications that operate on personal computers and mainframes working together as equals. In a few years, data will be safely and efficiently distributed within a network.

Based on the published design work of IBM's R* project (R* is the distributed version of DB2), at least two other SQL data base vendors, Relational Technology, Inc. and Oracle Corp., have announced distributed versions of SQL. Meanwhile, IBM continues work on the implementation of R*, which is likely to take several more years.

The significance of "distributed SQL" to end users is that they may finally be able to cost-justify applications previously prohibited because of data communications costs. Instead of periodically uploading or downloading data for local processing, remote users will be able to let their DBMS software manage and control their data, resulting in more real-time processing, less data redundancy and fewer errors, which now result from uncoordinated data management.

Since vendors are working on distributed SQL support for a multitude of computers, there is much promise for implementing SQL applications in so-called heterogeneous networks in which dissimilar computers are networked together. This situation will allow users to access data previously unavailable to them because it resides in another computer system.

Finally — and perhaps most important to end users — because SQL will be the first DBMS to be implemented on a wide variety of computers, it will be key to bringing together the best of the PC and mainframe technologies. User productivity will be improved by combining the highly interactive user interface possible on PC workstations (things like pop-up windows, effective use of colors, mice and so on) with the power and storage capacity of mainframes and minicomputers. Users will not only integrate their personal computer and mainframe systems but will also have the best of both worlds.

Essentially, the industry is seeing the convergence of two new standards: SQL for data base access and the IBM PC (or compatible) for theuser interface. In time, instead of supporting multiple 3270 terminal environments like CICS, IMS/DC and IDMS/DC, vendors can develop only for the IBM PC standard. This transition from highly centralized mainframe processing to using PC workstations linked to mainframes does not require SQL. But the distributed SQL vendors will perform a useful service to legitimize this cooperative processing environment.

These optimistic glimpses into the SQL and DB2 future should not suggest that there will be no problems. This technology is young and immature and has not yet proven its viability in large-scale, high-volume, on-line transaction processing environments.

Also, there is more to an application than a data base. The SQL vendors each have their set of tools to aid application development: typically a screen editor, a report writer, an extended dictionary, a high-level language and an ability to invoke or be invoked by other programming languages. It is unlikely thet applications built using one SQL vendor's tools will be portable to other SQL environments. So the concepts of DB2 compatibility and transportable SQL are bound to cause confusion.

Another question is whether it will be practical to convert existing applications to SQL and whether the benefits of converting will be more illusory than real. The real benefits of using a relational data base system come when the application is designed to exploit the capability of that system.

Despite these concerns, the current enthusiasm about SQL seems encouraging. This potential for standardization may now enable both software vendors and MIS departments to get back to the business of truly serving their customers, the end users.

Kaiser is director of research for Data Design Associates, a developer of accounting and financial management software for IBM mainframes, based in Sunnyvale, Calif. He is charged with future product development, including the company's direction regarding DB2, SQL and distributed data processing using PCs.

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Cooperative processing

BY MARTIN EDELSTEIN AND DONALD WSZOLEK

A series of recent product announcements from IBM, collectively known as the Enhanced Connectivity Facilities (ECF), is supposedly the first step toward the full integration of the Personal Computer into the mainframe environment. The purported goal of this process is a true peer-to-peer relationship along the lines of the much-ballyhooed LU6.2 communications standards.

While these recent announcements are somewhat encouraging, they also indicate thet IBM'a progress in this area will be slow and incremental. The ECF products represent only a small subset of a full LU6.2-type implementation, and even these limited offerings will not become fully available for more than a year. The new products are also expected to cost as much as several thousand dollars per workstation, and this total does not include the extensive cost of retooling applications software.

Of course, users will also incur the opportunity costs associated with waiting. Mainframe application development backlogs are running up to several years. A truly versatile PC-to-mainframe link could reduce some of the dependence of developers on mainframe resources by placing more of the development and processing burden on the PC.

As it is, however, the continuing proliferation of PCs may actually be contributing to the increasing headaches of mainframe computer users. The vast majority of PC-to-mainframe packages are terminal emulators and/or file transfer programs that have minimal effect on the overall throughput of most DP operations. They may rid the PC user of that extra mainframe terminal, but they do little to reduce the load on the mainframe or its teleprocessing system.

A different approach, called cooperative processing, involves treating the PC not as either a dumb terminal or a surrogate mainframe, but rather as an intelligent peripheral to the mainframe host. The PC can be used to handle tasks it does well, leaving overall control and coordination of the application to a mainframe host, where it logically belongs.

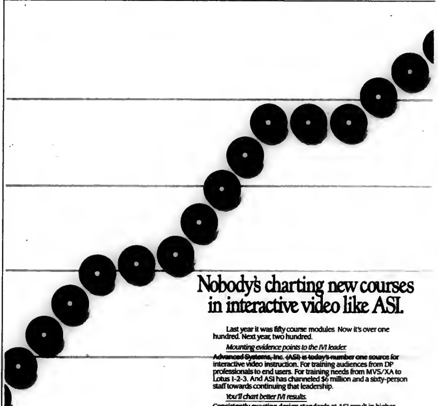
This approach can be implemented in almost any existing environment. A user can begin with an ordinary bisynchronous communications link under Systems Network Architecture. To this, add a software package on the PC thet allows it to operate as a very smart terminal with its own auxiliary mass storage. Via this software, the PC maintains copies of all the menu and data-entry screen specifications for target applications on its local drives. Whenever a mainframe application program requires the display of a screen, it sends the PC an appropriate message; the PC then recalls that screen'a specifications from disk and produces the display.

The screen specifications resident on the PC can include all the parameters necessary for editing the data that is to be entered for each screen. When the mainframe requires a screen of user input, it merely sends a message to that effect to the PC, which can then proceed to accept data from the user without mainframe intervention. When a given screen entry is complete, the PC can send it back to the mainframe in a fully edited form or can store the entry on its local disk drive for later transmission.

This cooperative approach requires no special hardware and no modifications to the user'a existing communications setup. It also places no particular constraints on his application design; in fact, the user'a options have actually broadened since the PC can offer far more display and editing features than a dumb terminal. The entire data entry process requires little mainframe processing or communications overhead, and yet every action of the PC is effectively under the control of the host.

Communications software incorporating the cooperative approach is just now coming to market. As users will soon discover, they already own most of the resources required for an effective PC-to-mainframe link. Therefore they may well forego waiting on IBM'a promises and get on with cooperative processing themselves.

Edelstein is president of Multi Soft, Inc. of Lawrenceville, N.J. Wszolek is the firm's vice-president of marketing and sales.



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